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Ambient Water Quality Criteria Recommendations

Information Supporting the Development of State and Tribal Nutrient Criteria

Rivers and Streams in Nutrient Ecoregion V

EPA-822-B-01-014

AMBIENT WATER QUALITY CRITERIA RECOMMENDATIONS

INFORMATION SUPPORTING THE DEVELOPMENT OF STATE AND TRIBAL NUTRIENT CRITERIA

FOR

RIVERS AND STREAMS IN NUTRIENT ECOREGION V

South Central Cultivated Great Plains

including all or parts of the States of:

Montana, North Dakota, South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, Texas, and New Mexico,

and the authorized Tribes within the Ecoregion

U.S. ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF WATER
OFFICE OF SCIENCE AND TECHNOLOGY
HEALTH AND ECOLOGICAL CRITERIA DIVISION
WASHINGTON, DC

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FOREWORD

This document presents EPA's nutrient criteria for **Rivers and Streams in Nutrient Ecoregion V**. These criteria provide EPA's recommendations to States and authorized Tribes for use in establishing their water quality standards consistent with section 303(c) of the Clean Water Act (CWA). Under section 303(c) of the CWA, States and authorized Tribes have the primary responsibility for adopting water quality standards as part of State or Tribal law or regulation. Federal regulations require State and Tribal standards to contain scientifically defensible water quality criteria that are protective of designated uses. EPA's recommended section 304(a) criteria are not laws or regulations; they are guidance that States and Tribes may use as a starting point in creating their own water quality standards.

The term "water quality criteria" is used in two sections of the CWA, section 304(a)(1) and section 303(c)(2). The term has a different impact in each section. On the one hand, in section 304, the term represents a scientific assessment of ecological and human health effects that EPA recommends to States and authorized Tribes for establishing water quality standards that ultimately provide a basis for controlling discharges or releases of pollutants or related parameters. On the other hand, in section 303, ambient water quality criteria are developed by States and Tribes as part of their water quality standards, to define the level of a pollutant (or in the case of nutrients, a condition) necessary to protect designated uses in ambient waters.

Quantified water quality criteria contained within State or Tribal water quality standards are essential to a water quality-based approach to pollution control. Whether expressed numerically or as quantified translations of narrative criteria within State or Tribal water quality standards, quantified criteria are critical for assessing attainment of designated uses and measuring progress toward meeting CWA goals.

EPA is developing section 304(a) water quality criteria for nutrients because States and Tribes consistently identify excessive levels of nutrients as a major reason that as many as half of the Nation's surface waters surveyed do not meet water quality objectives, such as full support of aquatic life. EPA expects to develop nutrient criteria that cover four major types of waterbodies—lakes and reservoirs, rivers and streams, estuarine and coastal areas, and wetlands—across 14 major ecoregions of the United States. EPA's section 304(a) criteria are intended to provide for the protection and propagation of aquatic life and recreation. To support the development of nutrient criteria, EPA has published and will continue to publish technical guidance manuals that describe a process for assessing nutrient conditions in the four waterbody types listed above.

EPA's section 304(a) water quality criteria for nutrients provide numeric water quality criteria and procedures to help establish quantified criteria within State or Tribal water quality standards. In the case of nutrients, EPA section 304(a) criteria establish values for causal variables (e.g., total nitrogen and total phosphorus) and response variables (e.g., turbidity and chlorophyll *a*). EPA believes that State and Tribal water quality standards need to include quantified endpoints for causal and response variables to provide sufficient protection of uses and to maintain downstream uses. These endpoints will most often be expressed as numeric water quality criteria or as procedures to translate a State or Tribal narrative criterion into a quantified endpoint.

States and authorized Tribes have several options in adopting these criteria. EPA recommends the following approaches, in order of preference:

1. Wherever possible, develop nutrient criteria that fully reflect local conditions and protect specific designated uses through the process described in EPA's technical guidance manuals for nutrient criteria development. Such criteria may be expressed either as numeric criteria or as procedures to translate a State or Tribal narrative criterion into a quantified endpoint in State or Tribal water quality standards.

2. Adopt EPA's section 304(a) water quality criteria for nutrients, either as numeric criteria or as procedures to translate a State or Tribal narrative nutrient criterion into a quantified endpoint.

3. Develop nutrient criteria protective of designated uses using other scientifically defensible methods and appropriate water quality data.

EPA developed the nutrient criteria recommendations in this document with the intent that they serve as a starting point for States and Tribes to develop more refined criteria, as appropriate, to reflect local conditions. The values presented in this document generally represent nutrient levels that protect against the adverse effects of nutrient overenrichment. They are based on the information that was available to the Agency at the time of this publication. EPA expects States and Tribes may have additional information and data that may be utilized in the refinement of these criteria. EPA offers to work with States and authorized Tribes to establish the necessary quantitative endpoints to reduce the excess nutrient inputs into our nation's waters and to prevent any further impairments.

Geoffrey H. Grubbs, Director
Office of Science and Technology

DISCLAIMER

This document provides technical guidance and recommendations to States, authorized Tribes, and other authorized jurisdictions to develop water quality criteria and water quality standards under the Clean Water Act (CWA) to protect against the adverse effects of nutrient overenrichment. Under the CWA, States and authorized Tribes are to establish water quality criteria to protect designated uses. State and Tribal decisionmakers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance when appropriate and scientifically defensible. Even though this document contains EPA's scientific recommendations regarding ambient concentrations of nutrients that will protect aquatic resource quality, it does not substitute for the CWA or EPA regulations, nor is it a regulation itself. Thus it cannot impose legally binding requirements on EPA, States, authorized Tribes, or the regulated community, and it might not apply to a particular situation or circumstance. EPA may change this guidance in the future.

EXECUTIVE SUMMARY

Nutrient Program Goals

EPA developed the National Strategy for the Development of Regional Nutrient Criteria (National Strategy) in June 1998. The strategy presents EPA's intentions to develop technical guidance manuals for four types of waters (lakes and reservoirs, rivers and streams, estuaries and coastal waters, and wetlands) and produce section 304(a) criteria for specific nutrient Ecoregions by the end of 2000. In addition, the Agency formed Regional Technical Assistance Groups (RTAGs), which include State and Tribal representatives working to develop more refined and localized nutrient criteria based on approaches described in the waterbody guidance manuals. This document presents EPA's current recommended criteria for total phosphorus (TP), total nitrogen (TN), chlorophyll *a*, and turbidity for rivers and streams in Nutrient Ecoregion V, which were derived using the procedures described in the *Rivers and Streams Nutrient Criteria Technical Guidance Manual* (U.S. EPA, 2000b).

EPA's ecoregional nutrient criteria address cultural eutrophication—the adverse effects of excess human-caused nutrient inputs. The criteria are empirically derived to represent surface waters that are minimally impacted by human activities and protective of aquatic life and recreational uses. The information contained in this document represents starting points for States and Tribes to develop (with assistance from EPA) more refined nutrient criteria.

In developing these criteria recommendations, EPA followed a process that included, to the extent they were readily available, the following critical elements:

- **Historical and recent nutrient data in Nutrient Ecoregion V.** Data sets from Legacy STORET, NASQAN, NAWQA, EPA Region 7 - Central Plains Center for BioAssessment (CPCB), EPA Region 7 - CPCB 2, EPA Region 7 - REMAP, EPA Region 8 - Montana and Wyoming, EPA Region 8 - South Dakota, and EPA Region 8 - North Dakota were used to assess nutrient conditions from 1990 to 2000.

- **Reference sites/reference conditions in Nutrient Ecoregion V.** Reference conditions presented are based on 25th percentiles of all nutrient data, including a comparison of reference conditions for the aggregate Ecoregion versus the subecoregions. States and Tribes are urged to determine their own reference sites for rivers and streams at different geographic scales and to compare them to EPA's reference conditions.

- **Models employed for prediction or validation.** EPA did not identify any specific models to develop nutrient criteria. States and Tribes are encouraged to identify and apply appropriate models to support nutrient criteria development.

- **RTAG expert review and consensus.** EPA recommends that when States and Tribes prepare their nutrient criteria, they obtain the expert review and consent of the RTAG.

- **Downstream effects of criteria.** EPA encourages the RTAG to assess the potential effects of the proposed criteria on downstream water quality and uses.

In addition, EPA followed specific **QA/QC procedures** during data collection and analysis. All data were reviewed for duplications. All data were from ambient waters that were not located directly outside a permitted discharger. The following States indicated that their data were sampled and analyzed using either standard methods or EPA-approved methods: North Dakota, South Dakota, Montana, Wyoming, Colorado, Kansas, Oklahoma, and Texas. Nebraska indicated that standard or EPA-approved methods were used for some specific nutrient parameters.

The following tables contain a summary of aggregate and level III Ecoregion values for TN, TP, water column chlorophyll *a*, and turbidity.

BASED ON 25th PERCENTILES ONLY

Nutrient Parameters	Aggregate Nutrient Ecoregion V Reference Conditions
Total phosphorus (µg/L)	67
Total nitrogen (mg/L) (reported)	0.88
Chlorophyll *a* (µg/L) (Fluorometric method)	3
Turbidity (FTU)	7.83

For subecoregions 25, 27, 32, and 42, the ranges of nutrient parameter reference conditions are as follows:

BASED ON 25th PERCENTILE ONLY

Nutrient Parameters	Range of Level III Subecoregions Reference Conditions
Total phosphorus (µg/L)	41 - 90*
Total nitrogen (mg/L)	0.84 - 1.07
Chlorophyll *a* (µg/L) (Fluorometric method)	2.51 - 3.2
Turbidity (FTU)	3 - 9.01

* This value appears inordinately high and may either be a statistical anomaly or reflect a unique condition. In any case, further regional investigation is indicated to determine the sources, i.e., measurement error, notational error, statistical anomaly, naturally enriched conditions, or cultural impacts.

NOTICE OF DOCUMENT AVAILABILITY

This document is available electronically to the public through the Internet at http://www.epa.gov/OST/standards/nutrient.html. Requests for hard copies of the document should be made to EPA's National Service Center for Environmental Publications (NSCEP), 11029 Kenwood Road, Cincinnati, OH 45242; telephone (513) 489-8190 or toll free (800) 490-9198. Please refer to EPA document number EPA-822-B-01-014 .

ACKNOWLEDGMENTS

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1.0 INTRODUCTION

Background

Nutrients are essential to the health and diversity of surface waters. However, in excessive amounts nutrients cause eutrophication or hypereutrophication, which results in overgrowth of plant life and decline of the biological community. Excessive nutrients can also result in human health risks, such as the growth of harmful algal blooms, most recently manifested in the *Pfiesteria* outbreaks on the Gulf and East Coasts. Chronic nutrient overenrichment of a waterbody can lead to the following consequences: algal blooms, low dissolved oxygen, fish kills, overabundance of macrophytes, likely increased sedimentation, and species shifts of both flora and fauna.

Historically, National Water Quality Inventories have repeatedly shown that nutrients are a major cause of ambient water quality use impairments. EPA's 1996 National Water Quality Inventory report identifies excessive nutrients as the leading cause of impairment in lakes and the second leading cause of impairment in rivers (behind siltation). In addition, nutrients were the second leading cause of impairments after siltation reported by the States in their 1998 lists of impaired waters. Where use impairment is documented, nutrients contribute roughly 25%-50% of the impairment nationally. The Clean Water Act (CWA) establishes that, wherever possible, water quality must provide for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water and/or protecting the physical, chemical, and biological integrity of those waters. In adopting water quality standards, States and Tribes designate uses for their waters in consideration of these CWA goals, and establish water quality criteria that contain sufficient parameters to protect that integrity and those uses. To date, EPA has not published information and recommendations under section 304(a) for nutrients to assist States and Tribes in establishing numeric nutrient criteria to protect uses when adopting water quality standards.

In 1995, EPA gathered a set of national experts and asked them how best to deal with the national nutrient problem. The experts recommended that the Agency not develop single criteria values for phosphorus (P) or nitrogen (N) applicable to all waterbodies and regions of the country. Rather, they recommended that EPA put a premium on regionalization, develop guidance (assessment tools and control measures) for specific waterbodies and ecological regions across the country, and use reference conditions (conditions that reflect pristine or minimally impacted waters) as a basis for developing nutrient criteria.

With these suggestions as starting points, EPA developed the National Strategy for the Development of Regional Nutrient Criteria (National Strategy), published in June 1998. This strategy presented EPA's intentions to develop technical guidance manuals for four types of waters (lakes and reservoirs, rivers and streams, estuaries and coastal waters, and wetlands), and thereafter to publish section 304(a) criteria recommendations for specific nutrient Ecoregions. Technical guidance manuals for lakes/reservoirs and rivers/streams were published in April 2000 and July 2000, respectively. The technical guidance manual for estuaries/coastal waters was published in fall 2001, and the draft wetlands technical guidance manual will be published by

December 2001. Each manual presents EPA's recommended approach for developing nutrient criteria values for a specific waterbody type. In addition, EPA is committed to working with States and Tribes to develop more refined and localized nutrient criteria based on approaches described in the waterbody guidance manuals and this document.

Overview of the Nutrient Criteria Development Process

For each nutrient Ecoregion, EPA developed a set of recommendations for two causal variables (total nitrogen and total phosphorus) and two early indicator response variables (chlorophyll *a* [chl *a*] and some measure of turbidity). Other indicators such as dissolved oxygen, macrophyte or benthic algal growth or speciation, and other fauna and flora changes are also useful. However, the first four variables are considered to be the best suited for protecting designated uses.

The technical guidance manuals describe a process for developing nutrient criteria that involves consideration of five factors. The first of these is the Regional Technical Assistance Group (RTAG), which is a body of qualified regional specialists able to objectively evaluate all of the available evidence and select the value(s) appropriate to nutrient control in the water bodies of concern. These specialists may come from such disciplines as limnology, biology, or natural resources management—especially water resource management, chemistry, and ecology. The RTAG evaluates and recommends appropriate classification techniques, usually physical, for criteria determination within an ecoregional construct.

The second factor is the historical information available to establish a perspective of the resource base. This is usually data and anecdotal information available within the past 10-25 years. This information gives evidence about the background and enrichment trend of the resource.

The third factor is the existing reference condition, a selection of reference sites chosen to represent the least culturally impacted waters of the class at the present time. The data from these sites are combined and a value is selected to represent the reference condition, the best attainable, most natural condition of the resource base at this time.

The RTAG comprehensively evaluates these three elements to propose a candidate criterion (initially one each for TP, TN, chl *a*, and some measure of turbidity).

A fourth factor often employed is mechanistic or empirical models of the historical and reference condition data to better understand the condition of the resource.

The final element of the process is assessment by the RTAG of the likely downstream effects of the criterion. Will there be a negative, positive, or neutral effect on the downstream waterbody? If the RTAG judges that a negative effect is likely, then the proposed State/Tribal water quality criteria should be revised to ameliorate the potential for any adverse downstream effects.

Although States and authorized Tribes do not necessarily need to incorporate all five elements into their water quality criteria setting process (e.g., modeling may be significant in only some instances), the best assurance of a representative and effective criterion is a balanced incorporation of all five elements.

Because some parts of the country have naturally different soil and parent material nutrient content and different precipitation regimes, the application of the criterion development process should reflect this regional variation. Therefore, an ecoregional approach was chosen. Initially, the continental United States was divided into 14 separate Ecoregions of similar geographical characteristics and similar nutrient condition (Figure 1a). Ecoregions are defined as regions of relative homogeneity in ecological systems; they depict areas within which the mosaic of ecosystem components (biotic and abiotic as well as terrestrial and aquatic) is different from adjacent areas in a holistic sense. Geographic characteristics such as soils, vegetation, climate, geology, and land cover are relatively similar within each Ecoregion (Omernik, 2000).

The nutrient Ecoregions are aggregates of EPA's hierarchical level III Ecoregions (see Figure 1b for map of level III Ecoregions). As such, they are more generalized and less defined than level III Ecoregions. EPA determined that setting ecoregional criteria for the large-scale aggregates is not without its drawbacks: variability is high because of the lumping of many waterbody classes, seasons, and years worth of multipurpose data over a large geographic area. For these reasons, the Agency recommends that States and Tribes develop nutrient criteria at the level III ecoregional scale and at the waterbody-class scale, where those data are readily available. Data analyses and recommendations on both the large aggregate Ecoregion scale and the more refined scales (level III Ecoregions and waterbody classes), where data were available to make such assessments, are presented for comparison and completeness of analysis.

Comparison of Nutrient Criteria to Biological Criteria

Biological criteria are quantitative expressions of the desired condition of the aquatic community. Such criteria can be based on data from sites that represent the least impacted attainable condition for a particular waterbody type in an Ecoregion, subecoregion, or watershed. EPA's nutrient criteria recommendations and biological criteria recommendations have many similarities in their basic approaches to development and data requirements. Both are empirically derived from statistical analysis of field-collected data and expert evaluation of current reference conditions and historical information. Both use direct measurements from the environment to integrate the effects of complex processes that vary according to type and location of waterbody. The resulting criteria recommendations, in both cases, are efficient uses of existing resources and are holistic indicators of the water quality necessary to protect uses.

States and authorized Tribes can develop and apply nutrient and biological criteria in tandem, with each providing important and useful information to interpret both the nutrient enrichment levels and the biological condition of sampled waterbodies. For example, using the same reference sites for both types of criteria can lead to efficiencies in both sample design and data analysis. In one effort, environmental managers can obtain information to support assessment of biological and nutrient condition, either through evaluating existing data sets or

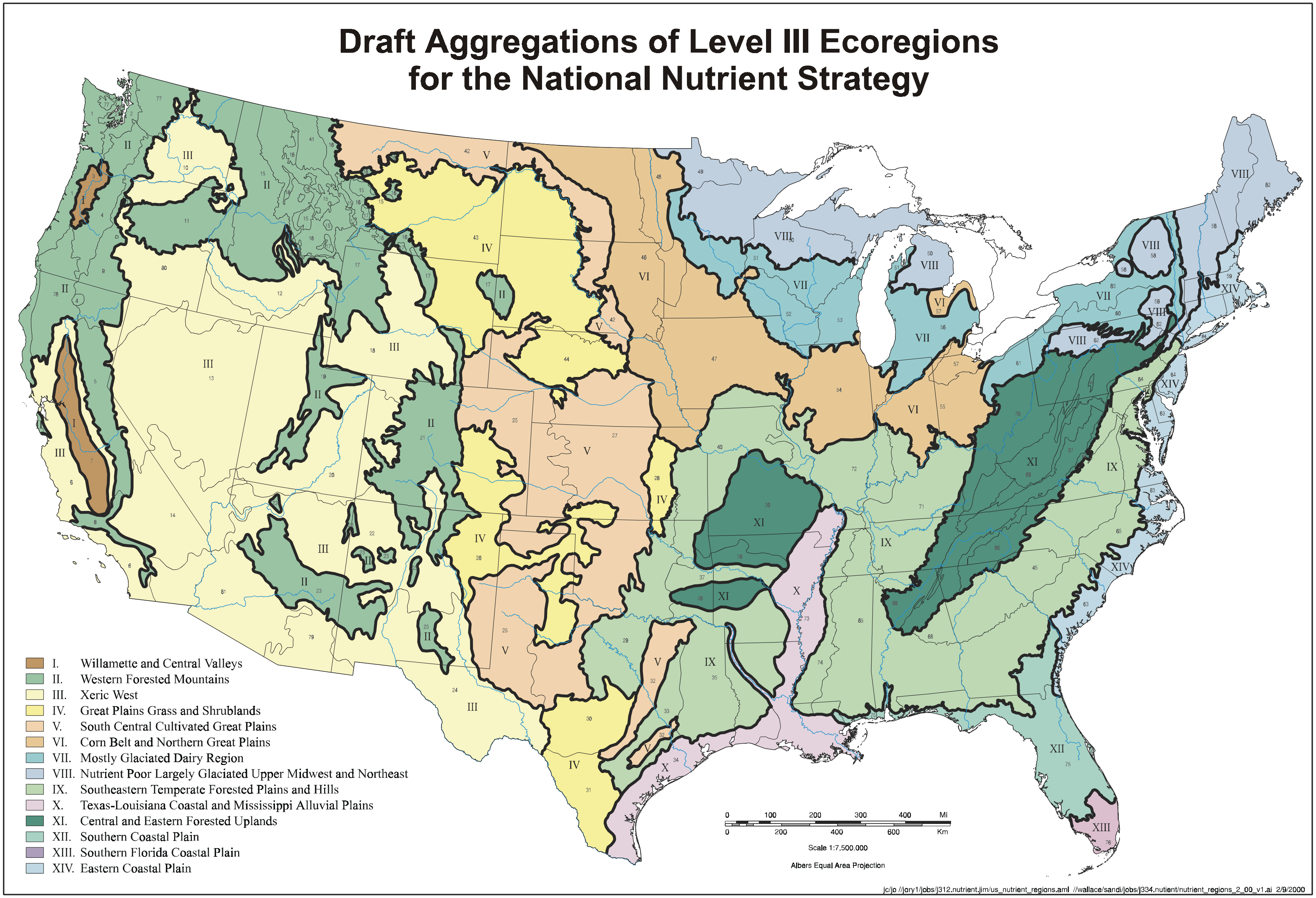


Figure 1a. Fourteen nutrient Ecoregions as delineated by Omernik (2000). Ecoregions were based on geology, land use, ecosystem type, and nutrient conditions.

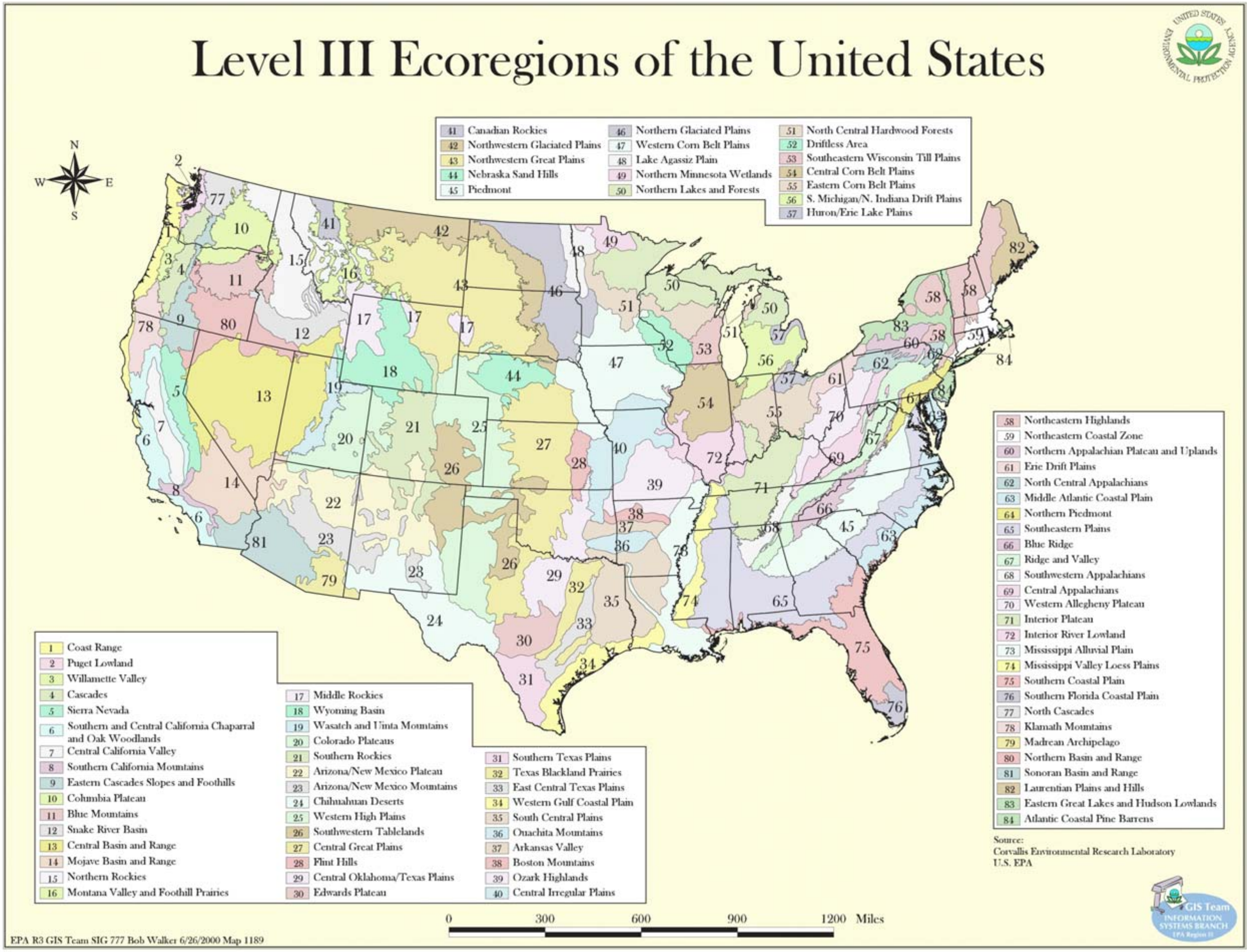


Figure 1b. Level III Ecoregions of the United States.

through designing and conducting a common sampling program. The traditional biological criteria variables of benthic invertebrate and fish sampling can be readily incorporated in a nutrient assessment. To investigate the effectiveness of this tandem approach, EPA has initiated pilot projects in both freshwater and marine environments to pursue the relationship between nutrient overenrichment and apparent declines in diversity of benthic invertebrates and fish.

2.0 BEST USE OF THIS INFORMATION

EPA recommendations published under section 304(a) of the CWA serve several purposes, including providing guidance to States and Tribes in adopting water quality standards for nutrients and ultimately controlling discharges or releases of pollutants. The recommendations also provide guidance to EPA when it determines that it is necessary to promulgate Federal water quality standards under section 303(c). Other uses include identification of overenrichment problems, management planning, project evaluation, and determination of status and trends of water resources.

State water quality inventories and listings of impaired waters consistently rank nutrient overenrichment as a top contributor to use impairments. EPA's water quality standards regulations at 40 CFR §131.11(a) require States and Tribes to adopt criteria that contain sufficient parameters and constituents to protect the designated uses of their waters. In addition, States and Tribes need quantifiable targets for nutrients to assess attainment of uses, develop water quality-based permit limits and source control plans, and establish targets for total maximum daily loads (TMDLs).

EPA expects States and Tribes to address nutrient overenrichment in their water quality standards and to build on existing State and Tribal efforts where possible. States and Tribes can address nutrient overenrichment through establishment of numerical criteria or use of narrative criteria statements (e.g., "free from excess nutrients that cause or contribute to undesirable or nuisance aquatic life or produce adverse physiological response in humans, animals, or plants"). In the case of narrative criteria, EPA expects that States and Tribes will establish procedures to quantitatively translate these statements for both assessment and source control purposes.

Ecoregional nutrient criteria are developed to represent surface waters that are minimally impacted by human activities and thus protect against the adverse effects of nutrient overenrichment from cultural eutrophication. EPA's recommended process for developing such criteria includes physical classification of waterbodies, determination of current reference conditions, evaluation of historical data and other information (such as published literature), use of models to simulate physical and ecological processes or determine empirical relationships among causal and response variables (if necessary), expert judgment, and evaluation of downstream effects. EPA has used elements of this process to produce the information contained in this document. The causal (total nitrogen, total phosphorus) and biological and physical response (chlorophyll *a*, turbidity) variables represent a set of starting points for States and Tribes to use in establishing their own criteria.

EPA recommends that States and Tribes establish numerical criteria based on section 304(a) guidance, section 304(a) guidance modified to reflect site-specific conditions, or other scientifically defensible methods. For many pollutants, such as toxic chemicals, EPA expects that section 304(a) guidance will provide an appropriate level of protection without further modification. EPA has also published methods for modifying 304(a) criteria, such as the water effect ratio, on a site-specific basis where conditions warrant modification to achieve the intended level of protection. For nutrients, however, EPA expects that it will usually be necessary for States and authorized Tribes to be more precise in identifying the nutrient levels that protect aquatic life and recreational uses. This can be achieved through criteria modified to reflect a smaller geographic scale than an Ecoregion, such as a subecoregion, the State or Tribe level, or a specific class of waterbodies. Criteria can be refined by grouping data or performing analyses at these smaller geographic scales. Refinement can also occur through further consideration of other elements such as published literature or models.

EPA expects that the values presented in this document generally represent nutrient levels that protect against the adverse effects of cultural overenrichment and are based on information available to the Agency at the time of this publication. However, States and Tribes should critically evaluate this information in light of the specific uses that need to be protected. For example, more sensitive uses may require more stringent criteria to ensure adequate protection. On the other hand, overly stringent levels of protection against cultural eutrophication may actually fall below the natural load of nutrients for certain waterbodies. In cases such as these, the level of nutrients specified may not be sufficient to support a productive fishery. In the criteria derivation process, it is important to distinguish between the natural load associated with a specific waterbody using historical data and expert judgment and current reference conditions. These elements of the criteria derivation process are best addressed by States and Tribes with access to information and local expertise. Therefore, EPA strongly encourages States and Tribes to use the information contained in this document to develop more refined criteria according to the methods described in EPA's technical guidance manuals for specific waterbody types.

To assist in further refinement of nutrient criteria, EPA has established 10 RTAGs (experts from EPA Regional Offices and States/Tribes). In refining criteria, States and authorized Tribes need to provide documentation of data and analyses, along with a defensible rationale, for any new or revised nutrient criteria they submit to EPA for review and approval. As part of EPA's review of State and Tribal standards, EPA intends to seek assurance from the RTAG that proposed criteria are sufficient to protect uses.

In using the information and recommendations in this document and elsewhere to develop numerical criteria or procedures to translate narrative criteria, EPA encourages States and Tribes to:

- Address both chemical causal variables and early indicator response variables. Causal variables are necessary to protect uses before impairment occurs and to maintain downstream uses. Early response variables are necessary to warn of possible impairment and to integrate the effects of variable and potentially unmeasured nutrient loads.

- Include variables that can be measured to determine if standards are met, and variables that can be related to the ultimate sources of excess nutrients.

- Identify appropriate periods of duration (how long) and frequency (how often) of occurrence in addition to magnitude (how much). EPA does not recommend identifying nutrient concentrations that must be met at all times; rather a seasonal or annual averaging period (e.g., based on weekly or biweekly measurements) is considered appropriate. However, these central tendency measures should apply each season or each year, except under the most extraordinary conditions (e.g., a 100-year flood).

3.0 AREA COVERED BY THIS DOCUMENT

This chapter provides a general description of the aggregate Ecoregion and its geographical boundaries. Descriptions of the level III subecoregions contained within the aggregate Ecoregion are also provided.

3.1 Description of Aggregate Ecoregion V

The nearly level, rolling, and irregular plains of Ecoregion V are mostly semiarid and originally supported mostly grassland. A large part of the area is now cropland and includes the major winter wheat growing area of the United States. The annual freeze-free growing season ranges from 120 days in the northwest to over 240 days in the southeast. Mean annual precipitation is typically erratic and generally decreases from about 28 inches in most eastern areas to about 15 inches in the west. Most of the precipitation occurs during the summer and amounts are usually enough to support dryland farming and rangeland. Intermittent and ephemeral streams are common in drier, western portions and/or where irrigation has lowered the water table.

Ecoregion V is in the transition zone between short and tall grass prairies. Purely tall grass is limited to wetter, easternmost areas whereas short grass is exclusively found in the drier, western part; in between, the potential natural vegetation is a mixture of tall and short grass species. Riparian woodland is usually restricted to wetter eastern areas. Scattered ponderosa pine is found on some ridgetops and bluffs especially in Nebraska. In southwestern Oklahoma and central Texas, shortgrass prairie originally grew with scattered, low shrubs and deciduous trees. The region's characteristic mix of short and tall grass prairie is distinct.

Parent geology (including salt formations) and soils help create the alkalinity, dissolved solid, sulfate, sodium, chloride, and suspended sediment concentrations of streams in Ecoregion V. High sulfate concentrations in stream water occur over broad areas; they are primarily the product of soil leaching and the dissolution of gypsum beds, although agricultural compounds such as ammonium sulfate and gypsum also can contribute sulfate to rivers (USGS, 1993).

The landforms, soils, and climate of Ecoregion V are favorable to agriculture. Today, more than half of Ecoregion V is dryland farmed, about a third is rangeland, and most of the remainder is used for irrigated farming. Ecoregion V is dominated by dryland winter wheat, grain sorghum, and alfalfa farming. Irrigated agriculture occurs in areas with sufficient available ground water and along some reaches of perennial rivers. The number of acres under irrigation have increased rapidly in Ecoregion V and produce silage corn, winter wheat, soybeans, grain sorghum, sugar beets, and other livestock feed and forage crops. The use of commercial fertilizer on cropland increased between 1969 and 1992. Cattle feed lots are found throughout most of the southern and central parts of the South Central Cultivated Great Plains (V); their density is higher than elsewhere in the United States and the number of cattle fattened at feedlots has increased between 1969 and 1992. Cattle graze much of the agriculturally marginal land and ground water is generally adequate to meet the needs of livestock; rangeland is not uncommon. Overall, the land use mosaic of the South Central Cultivated Great Plains (V) is distinct from that of the surrounding regions; winter wheat and feedlots are far more common than in adjacent ecoregions.

Agricultural runoff has affected regional water quality. Upward trends in nitrite plus nitrate levels in rivers have mirrored increasing nitrogen fertilizer use (U.S. Geological Survey, 1993). In the Platte River of central Nebraska between 1993 and 1995, dissolved nitrate concentrations were highest near cropland and pasture that have had intensive applications of chemical fertilizers. Stream sedimentation from agricultural activity has occurred and has negatively impacted aquatic habitat although no-till cropping practices and other conservation efforts have locally reduced field erosion. Runoff from feedlots is a significant regional water quality problem; nondisinfected runoff from livestock confinement areas have significantly elevated fecal coliform bacteria and nitrite plus nitrate concentrations in rivers (USGS, 1993).

Much of the region's irrigation water is obtained from wells or perennial streams. In many areas, ground water withdrawal rates have greatly exceeded recharge rates and have caused the water table to gradually decline, pumping costs to increase, and both springflow and streamflow to diminish. Perennial streams are uncommon and can fluctuate widely in flow from year to year due to the erratic rainfall that characterizes the region. In addition, irrigation return flows have increased the concentrations of sodium, sulfate, chloride, and dissolved solids in base flows. Irrigation return flows have the greatest impact on river quality during droughts when discharge is dominated by tailwater from irrigated fields. Locally, brines associated with petroleum production have increased the alkalinity, dissolved solid, sulfate, sodium, chloride, and suspended sediment concentrations of streams (USGS, 1993).

Some urban areas in Ecoregion V especially in Texas and Colorado have been growing rapidly and, resultantly, a great deal of agricultural land has been recently converted to urban and industrial uses. Discharges from municipalities and industries have caused elevated concentrations of nitrate and phosphorus in streams. Such increased nutrient loading has caused a corresponding increase in the eutrophication rates of some downstream lakes and reservoirs (USGS, 1993).

3.2 Geographical Boundaries of Aggregate Ecoregion V

Ecoregion V is a fragmented region composed of four separate segments in the central portion of the United States where cultivated Great Plains prevail (Figure 2). The northern most

Figure 2. Aggregate Ecoregion V.

segment begins along the northern border of Montana and goes southeast into the states of North Dakota, South Dakota, and Nebraska.

The second and largest segment is located in the south central portion of the country. It begins in small section of southwestern South Dakota and continues south into Texas. It encompasses the southeastern portion Wyoming, the eastern border of Colorado, and a large portion of Nebraska, Kansas, and Oklahoma. From north central Texas, the segment runs west into eastern New Mexico.

The last two segments are thin strips that run almost parallel from northeast to southeast Texas. The western segment is over double the size of the eastern strip.

3.3 Level III Subecoregions Within Aggregate Ecoregion V

There are four level III subecoregions contained within Aggregate Ecoregion V (Figure 3). The following are brief descriptions provided by Omernik (1999) of the climate, vegetative cover, topography, and other ecological information pertaining to these subecoregions.

25. Western High Plains

Higher and drier than the Central Great Plains to the east, and in contrast to the irregular, mostly grassland or grazing land of the Northwestern Great Plains to the north, much of the Western High Plains comprises smooth to slightly irregular plains having a high percentage of cropland. Grama-buffalo grass is the potential natural vegetation in this region as compared to mostly wheatgrass-needlegrass to the north, Trans-Pecos shrub savanna to the south, and taller grasses to the east. The northern boundary of this ecological region is also the approximate northern limit of winter wheat and sorghum and the southern limit of spring wheat crop production.

27. Central Great Plains

The Central Great Plains are slightly lower, receive more precipitation, and are somewhat more irregular than the Western High Plains to the west. Once a grassland, with scattered low trees and shrubs in the south, much of this ecological region is now cropland, the eastern boundary of the region marking the eastern limits of the major winter wheat growing area of the United States.

32. Texas Blackland Prairies

The Texas Blackland Prairies is a disjunct ecological region distinguished from surrounding regions by its fine textured clayey soils and predominantly prairie potential natural vegetation. This region now contains a higher percent of cropland than adjacent regions, although much of the land has been recently converted to urban and industrial uses.

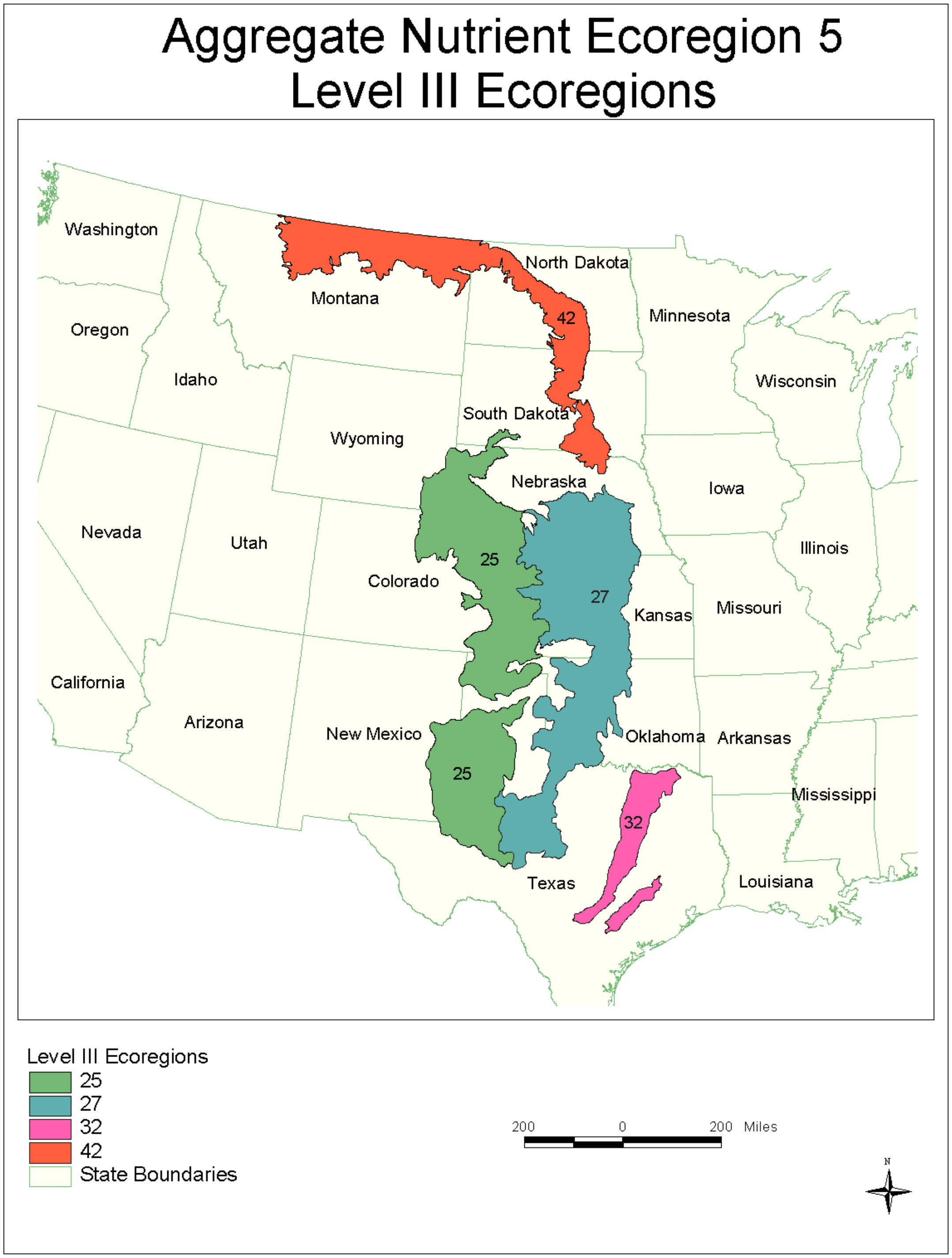


Figure 3. Aggregate Ecoregion V with level III Ecoregions shown.

42. Northwestern Glaciated Plains

The Northwestern Glaciated Plains Ecoregion is a transitional region between the generally more level, moister, more agricultural Northern Glaciated Plains to the east and the generally more irregular, dryer, Northwestern Great Plains to the west and southwest. The western and southwestern boundary roughly coincides with the limits of continental glaciation. This Ecoregion has a moderately high concentration of semi-permanent and seasonal wetlands, locally referred to as Prairie Potholes, that dot the landscape.

3.4 Suggested Ecoregional Subdivisions or Adjustments

EPA recommends that the RTAG evaluate the adequacy of EPA nutrient ecoregional and subecoregional boundaries and refine them as needed to reflect local conditions. See the paper by Dale Robertson (USGS, 2001b) for an alternative approach to ecoregions entitled "An Alternative Regarding the Scheme for Defining Nutrient Criteria for Rivers and Streams."

4.0 DATA REVIEW FOR RIVERS AND STREAMS IN AGGREGATE ECOREGION V

This section describes the nutrient data EPA has collected and analyzed for this Ecoregion, including an assessment of data quantity and quality. The data tables present the data for each causal parameter (total phosphorus and total nitrogen, both reported and calculated from TKN and nitrite/nitrate) and the primary response variables (some measure of turbidity and chlorophyll *a*). EPA considers these parameters essential to nutrient assessment, because the first two are the main causative agents of enrichment and the two response variables are the early indicators of enrichment for most surface waters (see Chapter 3 of the *Rivers and Streams Nutrient Criteria Technical Guidance Manual* [U.S. EPA, 2000b] for a complete discussion on choosing causal and response variables).

4.1 Data Sources

Data sets from Legacy STORET, NASQAN, NAWQA, EPA Region 7 - Central Plains Center for BioAssessment (CPCB), EPA Region 7 - CPCB 2, EPA Region 7 - REMAP, EPA Region 8 - Montana and Wyoming, EPA Region 8 - South Dakota, and EPA Region 8 - North Dakota were used to assess nutrient conditions from 1990 to 2000. EPA recommends that the RTAGs identify additional data sources that can be used to supplement the data sets listed above. In addition, the RTAGs may utilize published literature values to support quantitative and qualitative analyses.

4.2 Historical Data from Aggregate Ecoregion V (TP, TN, chl *a*, and turbidity)

EPA recommends that States/Tribes assess long-term trends observed over the past 50 years to assess the relative stability of the systems. This information may be obtained from scientific literature or documentation of historical trends. To gain additional perspective on more recent trends, it is recommended that States and Tribes assess nutrient variations over the past 10 years (e.g., what do seasonal variations indicate?).

4.3 QA/QC of Data Sources

An initial quality screen of data was conducted using the rules presented in Appendix C. Data remaining after screening for duplications and other QA measures (e.g., poor or unreported analytical records, sampling errors or omissions, stations associated with outfalls, stormwater sewers, hazardous waste sites) were used in the statistical analyses.

States within Ecoregion V were contacted regarding the quality of their data and information on the methods used to sample and analyze their waters. The following States indicated standard methods or approved EPA methods were used: North Dakota, South Dakota, Montana, Wyoming, Colorado, Kansas, Oklahoma, and Texas. Nebraska indicated that standard or EPA-approved methods were used for some specific nutrient parameters. New Mexico did not provide information prior to the publication of this document.

4.4 Data for All Rivers and Streams Within Aggregate Ecoregion V

Figure 4 shows the location of the sampling stations within each subecoregion. Table 1 presents all data records for all parameters for Aggregate Ecoregion V and subecoregions within the aggregate Ecoregion.

4.5 Statistical Analysis of Data

EPA's *Technical Guidance Manual for Developing Nutrient Criteria for Rivers and Streams* describes two ways of establishing a reference condition. One method is to choose the upper 25th percentile (75th percentile) of a reference population of streams. This is the preferred method. The 75th percentile is preferred by EPA because it is likely associated with minimally impacted conditions, will be protective of designated uses, and provides management flexibility. When reference streams are not identified, the second method is to determine the lower 25th percentile of the population of all streams within a region to attempt to approximate the preferred approach. The 25th percentile of the entire population was chosen by EPA to represent a surrogate for an actual reference population. Data analyses to date indicate that the lower 25th percentile from an entire population roughly approximates the 75th percentile for a reference population (see case studies for Minnesota lakes in the *Lakes and Reservoirs Nutrient Criteria Technical Guidance Document* [U.S. EPA, 2000a], the case study for Tennessee streams in the *Rivers and Streams Nutrient Criteria Technical Guidance Document* [U.S. EPA, 2000b], the letter from Tennessee Department of Environment and Conservation to Geoffrey Grubbs [TNDEC, 2000], the unpublished paper titled "Estimating the Natural Background Concentrations of Nutrients in Streams and Rivers of the Conterminous United States" [USGS, 2001], and the letter from Matthew Liebman, U.S. EPA Region 1 Nutrient Criteria Coordinator to Geoffrey Grubbs [U.S. EPA, 2000c]). New York State has also presented evidence that the 25th percentile and the 75th percentile compare well based on user perceptions of water resources (NYSDEC, 2000).

Tables 2 and 3a-d present potential reference conditions for both the aggregate Ecoregion and the subecoregions using both methods. However, the reference stream column is left blank

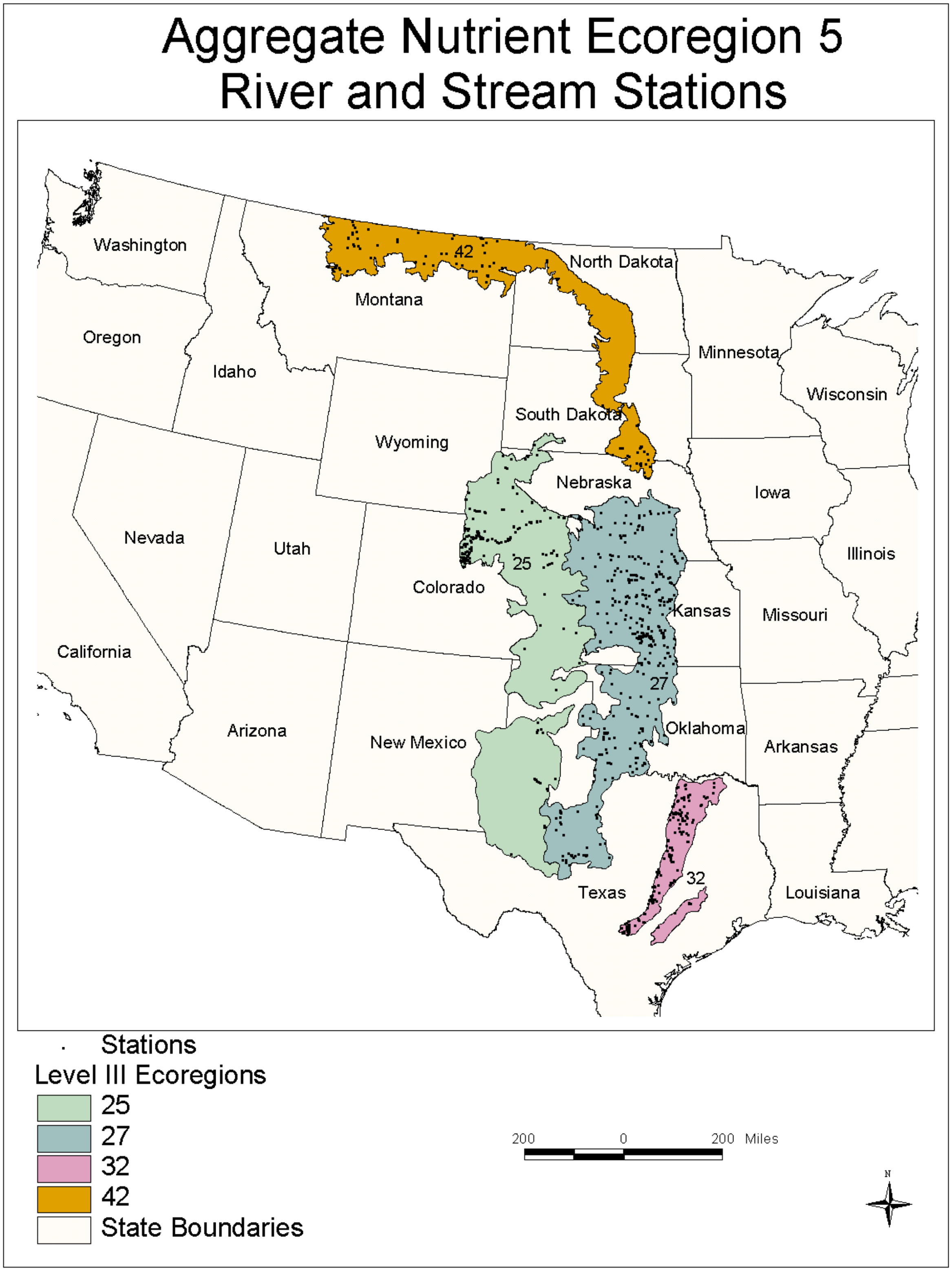


Figure 4. Sampling locations within each level III Ecoregion.

Table 1. River and stream records* for Aggregate Ecoregion V—South Central Cultivated Great Plains

	Aggregate Ecoregion V	Sub ecoR 25	Sub ecoR 27	Sub ecoR 32	Sub ecoR 42
# of named streams	556	123	266	109	58
# of stream stations	984	236	425	210	113
Key nutrient parameters (listed below)					
- # of records for turbidity (all methods)	5,725	714	4,108	656	247
- # of records for chlorophyll *a* (all methods)	1,517	237	532	722	26
- # of records for total Kjeldhal nitrogen (TKN)	7,817	2,402	2,639	2,233	543
- # of records for nitrite + nitrate (NO_2+NO_3)	6,830	1,542	3,638	1,274	376
- # of records for total nitrogen (TN)	987	219	562	49	157
- # of records for total phosphorus (TP)	12,325	3,221	6,025	2,381	698
Total # of records for key nutrient parameters	35,201	8,335	17,504	7,315	2,047

*The number of rivers and streams presented in this table is based on the number of rivers and streams for which nutrient data were provided in the National Nutrient database. This does not imply that this is the total of rivers and streams within the Ecoregion. States and Tribes should determine the representativeness of the tabular data by comparing this information with any additional material they may have.

Definitions: (1) # of records refers to the total count of observations for that parameter over the entire decade (1990-1999) for that particular aggregate or subecoregion. These are counts for all seasons over that decade. (2) # of stream stations refers to the total number of river and stream stations within the aggregate or subecoregion from which nutrient data was collected. Since streams and rivers can cross ecoregional boundaries, it is important to note that only those portions of a river or stream (and data associated with those stations) that exist within the Ecoregion are included within this table.

Table 2. Reference conditions for Aggregate Ecoregion V streams

Parameter	No. of streams N*	Reported values		25th percentiles based on all seasons data for the decade	Reference streams‡
		Min	Max	P25 all seasons†	P75 all seasons
TKN (mg/L)	332	0.00	5.54	0.45	
NO_2+NO_3-N (mg/L)	350	0.00	9.64	0.26	
TN (mg/L) - calculated				0.71	
TN (mg/L) - reported	94	0.23	9.85	0.88	
TP (µg/L)	489	0.00	2232	68	
Turbidity (NTU)	105	2	492	16	
Turbidity (FTU)	179	1.13	131.50	7.83	
Turbidity (JCU)	41	1.75	138.50	8.70	
Chlorophyll *a* (µg/L) - F	42	0.4	51	3	
Chlorophyll *a* (µg/L) - S	110	0.2	79.1	0.4	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

* N = largest value reported for a decade/season. TN calculated is based on the sum of TKN+NO_2+NO_3. TN reported is actual TN value reported in the database for one sample.
† Median for all seasons' 25th percentiles, e.g., this value was calculated from four seasons' 25th percentiles. If the seasonal 25th percentile (P25) TP values are: spring 10 µg/L, summer 15 µg/L, fall 12 µg/L, and winter 5 µg/L, the median value of all seasons' P25 will be 11µg/L.
‡ As determined by the Regional Technical Assistance Groups (RTAGs).

Abbreviations: P25, 25th percentile of all data; P75, 75th percentile of all data; F, Chlorophyll *a* measured by Fluorometric method with acid correction; S, Chlorophyll *a* measured by Spectrophotometric method with acid correction; T, Chlorophyll *a b c* measured by Trichromatic method; —, not applicable.

Definitions: (1) Number of Streams refers to the largest number of streams and rivers for which data existed for a given season within an aggregate nutrient Ecoregion. (2) Medians. All values (min, max, and 25th percentiles) included in the table are based on waterbody medians. All data for a particular parameter within a stream for the decade were reduced to one median for that stream. This prevents over-representation of individual waterbodies with a great deal of data versus those with fewer data points within the statistical analysis. (3) 25th percentile for all seasons is calculated by taking the median of the 4 seasonal 25th percentiles. If a season is missing, the median was calculated with 3 seasons of data. If fewer than 3 seasons were used to derive the median, the entry is flagged (z). (4) A 25th percentile for a season is best derived with data from a minimum of 4 streams/season. However, this table provides 25th percentiles that were derived with fewer than 4 streams/season in order to retain all information for all seasons. In calculating the 25th percentile for a season with fewer than 4 stream medians, the statistical program automatically used the minimum value within the fewer-than-4 population. If fewer than 4 streams were used in developing a seasonal quartile and or all-seasons median, the entry is flagged (zz).

Note: For seasonal values, refer to Appendix A, "Descriptive Statistics Data Tables for Aggregate Ecoregion."

Table 3a. Reference conditions for Ecoregion V streams subecoregion 25

Parameter	No. of streams N*	Reported values		25th percentiles based on all seasons data for the decade	Reference streams‡
		Min	Max	P25 all seasons†	P75 all seasons
TKN (mg/L)	73	0.00	5.28	0.54	
NO_2+NO_3-N (mg/L)	61	0.00	5.89	0.72	
TN (mg/L) - calculated				1.26	
TN (mg/L) - reported	24	0.49	9.36	1.07	
TP (µg/L)	103	0	1,988	60	
Turbidity (NTU)	24	2	492	12.60	
Turbidity (FTU)	16	2.75	57.50	4.36	
Turbidity (JCU)	—	—	—	—	
Chlorophyll *a* (µg/L) - F	20	1	51	3	
Chlorophyll *a* (µg/L) - S	12	0.2	26.1	5.1	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

Table 3b. Reference conditions for Ecoregion V streams subecoregion 27

Parameter	No. of streams N*	Reported values		25th percentiles based on all seasons data for the decade	Reference streams‡
		Min	Max	P25 all seasons†	P75 all seasons
TKN (mg/L)	139	0.05	4.41	0.52	
NO_2+NO_3-N (mg/L)	201	0.01	9.48	0.19	
TN (mg/L) - calculated				0.71	
TN (mg/L) - reported	54	0.26	3.74	0.84	
TP (µg/L)	246	3	1,958	90	
Turbidity (NTU)	68	3	179	22.13	
Turbidity (FTU)	133	1.88	119.75	9.01	
Turbidity (JCU)	33	2.53	137.25	10	
Chlorophyll *a* (µg/L) - F	16	0.7	38	2.5	
Chlorophyll *a* (µg/L) - S	32	0.2	49.4	1.3	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

Table 3c. Reference conditions for Ecoregion V streams subecoregion 32

Parameter	No. of streams N*	Reported values		25th percentiles based on all seasons data for the decade	Reference streams‡
		Min	Max	P25 all seasons†	P75 all seasons
TKN (mg/L)	89	0.09	2.59	0.38	
NO_2+NO_3-N (mg/L)	52	0.01	8.75	0.39	
TN (mg/L) - calculated				0.77	
TN (mg/L) - reported	3	0.85	1.90	0.85 (zz)	
TP (µg/L)	94	2	1,998	45	
Turbidity (NTU)	—	—	—	—	
Turbidity (FTU)	25	1.95	121.75	6.23	
Turbidity (JCU)	—	—	—	—	
Chlorophyll *a* (µg/L) - F	—	—	—	—	
Chlorophyll *a* (µg/L) - S	66	0.2	32.1	0.2	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

Table 3d. Reference conditions for Ecoregion V streams subecoregion 42

Parameter	No. of streams N*	Reported values		25th percentiles based on all seasons data for the decade	Reference streams‡
		Min	Max	P25 all seasons†	P75 all seasons
TKN (mg/L)	36	0.24	3.14	0.55	
NO_2+NO_3-N (mg/L)	38	0.01	3.36	0.06	
TN (mg/L) - calculated				0.61	
TN (mg/L) - reported	13	0.55	2.96	0.96	
TP (µg/L)	50	6	1,070	41	
Turbidity (NTU)	13	2.10	142	30	
Turbidity (FTU)	7	2.43	75.88	3	
Turbidity (JCU)	8 (z)	0.25	140	4.50	
Chlorophyll *a* (µg/L) - F	7	3.2	7.9	3.2	
Chlorophyll *a* (µg/L) - S	—	—	—	—	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

* N = largest value reported for a decade/season. TN calculated is based on the sum of TKN+NO_2+NO_3. TN reported is actual TN value reported in the database for one sample.
† Median for all seasons' 25th percentiles, e.g., this value was calculated from four seasons' 25th percentiles. If the seasonal 25th percentile (P25) TP values are: spring 10 µg/L, summer 15 µg/L, fall 12 µg/L, and winter 5 µg/L, the median value of all seasons' P25 will be 11µg/L.
‡ As determined by the Regional Technical Assistance Groups (RTAGs).

Abbreviations: P25, 25th percentile of all data; P75, 75th percentile of all data; F, Chlorophyll *a* measured by Fluorometric method with acid correction; S, Chlorophyll *a* measured by Spectrophotometric method with acid correction; T, Chlorophyll *a b c* measured by Trichromatic method; —, not applicable.

Definitions: (1) Number of Streams refers to the number of streams and rivers for which data existed for the summer months since summer is generally when the greatest amount of nutrient sampling is conducted. If another season greatly predominates, notification is made (s=spring, f=fall, w=winter). (2) Medians. All values (min, max, and 25th percentiles) included in the table are based on waterbody medians. All data for a particular parameter within a stream for the decade were reduced to one median for that stream. This prevents over-representation of individual waterbodies with a great deal of data versus those with fewer data points within the statistical analysis. (3) 25th percentile for all seasons is calculated by taking the median of the 4 seasonal 25th percentiles. If a season is missing, the median was calculated with 3 seasons of data. If fewer than 3 seasons were used to derive the median, the entry is flagged (z). (4). A 25th percentile for a season is best derived with data from a minimum of 4 streams/season. However, this table provides 25th percentiles that were derived with fewer than 4 streams/season in order to retain all information for all seasons. In calculating the 25th percentile for a season with fewer than 4 stream medians, the statistical program automatically used the minimum value within the fewer-than-4 population. If fewer than 4 streams were used in developing a seasonal quartile and or all-seasons median, the entry is flagged (zz).

Note: For seasonal and yearly values, refer to Appendix B, "Descriptive Statistics Data Tables for Level III Subecoregions Within Aggregate Ecoregion."

because EPA does not have reference data and anticipates that States/Tribes will provide information on reference streams. Tables 3a-d present potential reference conditions for rivers and streams in the level III subecoregions within the aggregate Ecoregion. Note that the footnotes for Table 2 apply to Tables 3a-d. Appendixes A and B provide a complete presentation of all descriptive statistics for both the aggregate Ecoregion and the level III subecoregions.

Tables 4 and 5 are presented for comparison purposes. They allow the reader to determine where, in the trophic state, the recommended reference conditions fall within traditionally viewed trophic boundaries.

4.6 Classification of River/Stream Type

Assessing the data by stream type should further reduce the variability in the data analysis. There were no readily available classification data in the national datasets used to develop these criteria. States and Tribes are strongly encouraged to classify their streams before developing a final criterion.

4.7 Summary of Data Reduction Methods

All descriptive statistics were calculated using the medians for each stream within **Ecoregion V** for which data existed. For example, if one stream had 300 observations for phosphorus over the decade or 1 year's time, one median resulted. Each median from each stream was then used in calculating the percentiles for phosphorus for the aggregate nutrient Ecoregion/subecoregion (level III Ecoregion) by season and year (Figures 5a, 5b).

Preferred Data Choices and Recommendations When Data Are Missing

1. **Where data are missing** or are very low in total records for a given parameter, use 25th percentiles for parameters within an adjacent, similar subecoregion within the same aggregate nutrient Ecoregion, **or** when a similar subecoregion cannot be determined, use the 25th percentile for the aggregate Ecoregion or consider the **lowest** 25th percentile from a subecoregion (level III) within the aggregate nutrient Ecoregion. Without data, one may assume that the subecoregion in question is as sensitive as the most sensitive subecoregion within the aggregate.

2. **TN calculated:** When reported total nitrogen (TN) median values are lacking or very low in comparison to TKN and Nitrate/Nitrite-N values, the medians for TKN and nitrite/nitrate-N are added, resulting in a calculated TN value. The number of samples (N) for calculated TN is not filled in because it is represented by two subsamples of data: TKN and nitrite/nitrate-N. Therefore, N/A is placed in this box.

3. **TN reported:** This is the median based on reported values for TN from the database.

Table 4. Suggested boundaries for trophic classification of streams from cumulative frequency distributions. The boundary between oligotrophic and mesotrophic systems represents the lowest third of the distribution and the boundary between mesotrophic and eutrophic marks the top third of the distribution.

Variable (units)	Oligotrophic-mesotrophic boundary	Mesotrophic-eutrophic boundary	Sample size (N)
mean benthic chlorophyll ($mg\ m^{-2}$)[a]	20	70	286
maximum benthic chlorophyll ($mg\ m^{-2}$)[a]	60	200	176
sestonic chlorophyll ($\mu g\ L^{-1}$)[b]	10	30	292
TN ($\mu g\ L^{-1}$)[a,c]	700	1,500	1,070
TP ($\mu g\ L^{-1}$)[a,b,c]	25	75	1,366

Note: This table is provided to allow the reader to make comparisons between the ecoregional criteria provided in this document and traditional nutrient and biological endpoints.

[a]Data from Dodds et al. (1998); [b]data from Van Nieuwenhuyse and Jones (1996); [c]data from Omernik (1977).

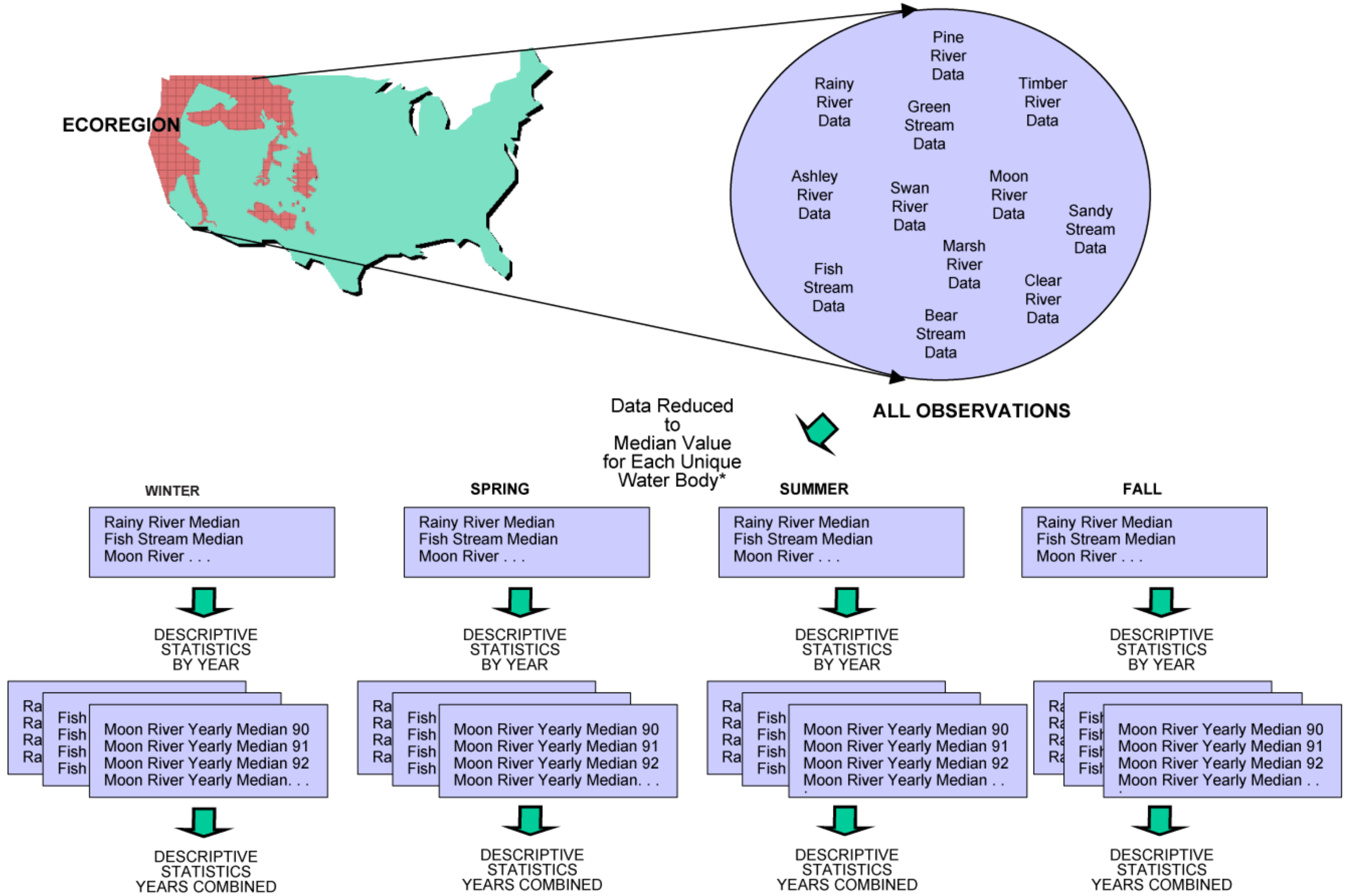
Table 5. Nutrient (µg/L) and algal biomass criteria limits recommended to prevent nuisance conditions and water quality degradation in streams based either on nutrient-chlorophyll *a* relationships or preventing risks to stream impairment as indicated.

Periphyton Maximum in mg/m²						
TN	**TP**	**DIN**	**SRP**	**Chlorophyll *a***	**Impairment Risk**	**Source**
				100-200	nuisance growth	Welch et al. 1988, 1989
275-650	38-90			100-200	nuisance growth	Dodds et al. 1997
1,500	75			200	eutrophy	Dodds et al. 1998
300	20			150	nuisance growth	Clark Fork River Tri-State
	20				*Cladophora* nuisance growth	Chetelat et al. 1999
	10-20				*Cladophora* nuisance growth	Stevenson unpubl. data
		430	60		eutrophy	UK Environ. Agency 1988
		100[a]	10[a]	200	nuisance growth	Biggs 2000
		25	3	100	reduced invertebrate diversity	Nordin 1985
			15	100	nuisance growth	Quinn 1991
		1,000	10[b]	~100	eutrophy	Sosiak pers. comm.
Plankton Mean in µg/L						
TN	**TP**	**DIN**	**SRP**	**Chlorophyll *a***	**Impairment Risk**	**Source**
300[c]	42			8	eutrophy	Van Nieuwenhuyse and Jones 1996
	70			15	chlorophyll action level	OAR 2000
250[c]	35			8	eutrophy	OECD 1992 (for lakes)

[a]30-day biomass accrual time.

[b]Total dissolved P.

[c]Based on Redfield ratio of 7.2N:1P (Smith et al. 1997).



**Unique Water Body - is a water body that is unique to a state, a subecoregion, a county, the year, and the season.*

Figure 5a. Illustration of data reduction process for stream data.

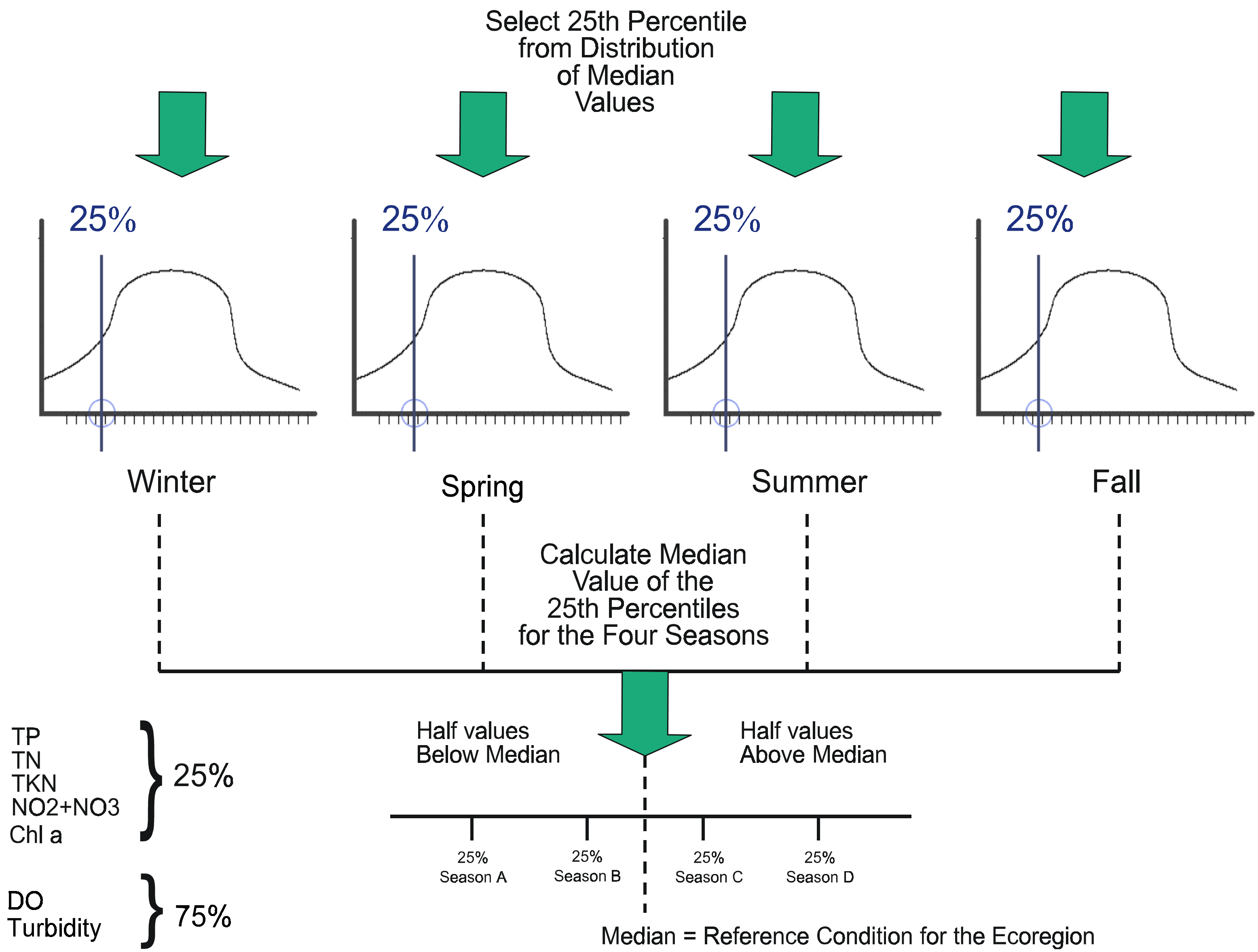


Figure 5b. Illustration of reference condition calculation.

4. **Chlorophyll *a*:** Medians based on all methods are reported; however, the acid-corrected medians are preferred to the uncorrected medians. In developing a reference condition from a particular method, it is recommended that the method with the most observations be used. Fluorometric and spectrophotometric observations are preferred over all other methods. However, when no data exist for fluorometric and spectrophotometric methods, trichromatic values may be used. Data from the various techniques are not interchangeable.

5. **Periphyton:** Where periphyton data exist, record them separately. For periphyton-dominated streams, a measure of periphyton chlorophyll is a more appropriate response variable than planktonic chlorophyll *a*. See Table 4, page 101, of the *Rivers and Streams Nutrient Technical Guidance Manual* (U.S. EPA, 2000b) for values of periphyton and planktonic chlorophyll *a* related to eutrophy in streams.

6. **Secchi depth:** The 75th percentile is reported for Secchi depth because this is the only variable for which the value of the parameter **increases** with greater clarity (for lakes and reservoirs only).

7. **Turbidity units:** Turbidity units from all methods are reported. FTUs and NTUs are preferred over JCUs. If FTUs and NTUs do not exist, use JCUs. These units are not interchangeable. Turbidity is chosen as a response variable in streams because it can be an indicator of increasing algal biomass due to nutrient enrichment. See pages 32-33 of the *Rivers and Streams Nutrient Technical Guidance Manual* for a discussion of turbidity and correlations with algal growth.

8. **Lack of data:** A dash (—) represents missing, inadequate, or inconclusive data. According to EPA statistical analyses, 5% or fewer of the reported observations are "below detection." Because of this low incidence, these data were retained and factored into the statistical analysis as reported according to the protocols described in Appendix C, "Quality Control/Quality Assurance Rules."

5.0 REFERENCE SITES AND CONDITIONS IN AGGREGATE ECOREGION V

Reference conditions represent the natural, least impacted conditions, or what is considered to be the most attainable conditions. This chapter compares the different reference conditions determined from the two methods and establishes which reference condition is most appropriate.

- *A priori* determination of reference sites. The preferred method for establishing reference condition is to choose the upper percentile of an a priori population of reference streams. States and Tribes are encouraged to identify reference conditions based on this method.

- Statistical determination of reference conditions (25th percentile of entire database). See Tables 2 and 3a-d in Section 4.0.

- RTAG discussion and rationale for selection of reference sites and conditions in Ecoregion V. The RTAG should compare the results derived from the two methods described above and present a rationale for the final selection of reference sites.

6.0 MODELS USED TO PREDICT OR VERIFY RESPONSE PARAMETERS

The RTAG is encouraged to identify and apply relevant models to support nutrient criteria development. There are three scenarios under which models may be used to derive criteria or support criteria development:

- Models for predicting correlations between causal and response variables

- Models used to verify reference conditions based on percentiles

- Regression models used to predict reference conditions in impacted areas

Appendix C of the Rivers and Streams Technical Guidance Manual (U.S. EPA, 2000b) and Chapter 9 of the Lakes and Reservoirs Technical Guidance Manual (U.S. EPA, 2000a) should be consulted for further details.

7.0 FRAMEWORK FOR REFINING RECOMMENDED NUTRIENT CRITERIA FOR RIVERS AND STREAMS IN AGGREGATE ECOREGION V

Information on each of the following six weight-of-evidence factors is important to refine the criteria presented in this document. All elements should be addressed in developing criteria, as is expressed in EPA's nutrient criteria technical guidance manuals. It is our expectation that EPA Regions, States, and Tribes (as RTAGs) will consider these elements as States/Tribes develop their criteria. This section should be viewed as a worksheet (sections are left blank for this purpose) to assist in the refinement of nutrient criteria. If many of these elements are ultimately unaddressed, EPA may rely on the proposed reference conditions presented in Tables 3a-d and other literature and information readily available to the EPA Headquarters nutrient team to develop nutrient water quality recommendations for this Ecoregion.

7.1 Example Worksheet for Developing Aggregate Ecoregion and Subecoregion Nutrient Criteria

*Literature sources:*____

Historical data and trends:

Reference condition:

Models:

RTAG expert review and consensus:

Downstream effects:

7.2 Setting Seasonal Criteria

The recommendations presented in this document are based in part on medians of all the 25th percentile seasonal data (decadal), and as such reflect all seasons and not one particular season or year. It is recommended that States and Tribes monitor in all seasons to best assess compliance with the resulting criterion. States/Tribes may choose to develop criteria that reflect **each** particular season or **given season** or a **given year** when there is significant variability between seasons/years or designated uses that are specifically tied to one or more seasons of the year (e.g., recreation, fishing). Using the tables in Appendix A and B, one can set reference conditions based on a particular season or year and then develop a criterion based on each individual season. Obviously, this option is season-specific and would require increased monitoring within each season to assess compliance. If a case can be made that one season is more appropriate than another season, or more appropriate than the annual median, criteria should be season specific. For example, in most parts of the country, spring and summer are the most common growth periods, so criteria for chlorophyll *a* and Secchi may be set for spring and summer only. However, caution should be used when developing criteria for TN and TP because the peak loading of these nutrients may take place in seasons other than summer, such as winter and spring. For these reasons, EPA developed annual criteria and provided additional seasonal information in appendices.

7.3 When Data/Reference Conditions Are Lacking

When data are unavailable to develop a reference condition for a particular parameter(s) within a subecoregion, EPA recommends one of three options: (1) use data from a similar neighboring subecoregion (e.g., if data are few or nonexistent for the Northern Cascades, consider using the data and reference conditions developed for the Cascades); (2) use the 25th percentiles for the aggregate Ecoregion; or (3) consider using the lowest of the yearly medians for that parameter calculated for all the subecoregions within the aggregate Ecoregion.

7.4 Site-Specific Criteria Development

Criteria may be refined in a number of ways. The best way is to follow the critical elements of criteria development as well as to refer to the *Rivers and Streams Nutrient Criteria Technical Guidance Manual* (U.S. EPA, 2000b). The Technical Guidance Manual presents sections on each of the following factors to consider in setting criteria:

- Refinements to Ecoregions (Section 2.3). See paper by Dale Robertson (USGS, 2001b), an alternative approach to ecoregions entitled "An Alternative Regarding the Scheme for Defining Nutrient Criteria for Rivers and Streams."
- Classification of waterbodies (Chapter 2)
- Setting seasonal criteria to reflect major seasonal climate differences and accounting for significant or cyclical precipitation events (high-flow/low-flow conditions) (Chapter 4)

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9.0 APPENDICES

A. Descriptive Statistics Data Tables for Aggregate Ecoregion
B. Descriptive Statistics Data Tables for Level III Subecoregions Within Aggregate Ecoregion
C. Quality Control/Quality Assurance Rules

APPENDIX A

Descriptive Statistics Data Tables for Aggregate Ecoregion

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1999 to 2000
Chloro_A_Fluor_cor_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	42	5.33	.70000	19.00	4.50	0.69	85	1.00	1.60	3.90	7.85	11.50
SPRING	21	8.64	.03000	50.89	12.53	2.73	145	0.28	3.04	4.84	6.70	37.98
SUMMER	41	21.92	.37000	67.80	21.38	3.34	98	1.55	5.85	14.85	36.20	62.69

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V

Rivers and Streams

Descriptive Statistics by Decade and Season

from 1999 to 2000

Chloro_A_Pheo_cor_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	21	3.19	.50000	7.60	2.19	0.48	69	0.60	1.60	2.70	3.40	7.00
SPRING	21	4.11	.05000	19.78	5.05	1.10	123	0.19	1.70	2.44	3.48	15.90
SUMMER	21	9.89	1.9000	41.40	9.19	2.01	93	2.90	4.65	6.80	12.35	25.60

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1996
Chloro_A_Phyto_Spec_A_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	78	4.60	.25000	42.20	7.31	0.83	159	0.25	0.25	1.42	5.90	20.06
SPRING	93	6.93	.25000	116.00	13.46	1.40	194	0.25	0.50	2.86	9.10	19.80
SUMMER	110	11.58	.25000	128.00	18.83	1.80	163	0.25	1.02	3.95	14.18	48.60
WINTER	75	3.38	.25000	21.90	4.33	0.50	128	0.25	0.38	2.00	4.00	13.60

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
DIP_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	62	165.54	5.0000	1875.00	306.42	38.92	185	5.00	20.00	43.75	175.00	745.00
SPRING	42	185.80	5.0000	1375.00	289.45	44.66	156	5.00	12.50	67.50	175.00	765.00
SUMMER	61	153.78	5.0000	1660.00	318.48	40.78	207	5.00	13.35	39.19	110.00	1062.5
WINTER	43	208.36	5.0000	2100.00	390.45	59.54	187	5.00	13.75	77.50	170.00	937.50

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1998 to 1998
Dissolved_Oxygen_percent_sat

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
SUMMER	1	138.03	138.03	138.03	.	.	.	138.03	138.03	138.03	138.03	138.03

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
Dissolved_Oxygen_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	328	8.67	.40000	13.70	1.95	0.11	22	4.75	7.80	8.83	10.00	11.25
SPRING	379	8.98	.70000	14.00	1.64	0.08	18	6.43	8.10	9.05	10.00	11.20
SUMMER	446	7.43	.70000	12.50	1.58	0.07	21	4.90	6.48	7.60	8.33	10.08
WINTER	316	11.24	5.6000	16.09	1.38	0.08	12	8.90	10.30	11.41	12.20	13.13

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
Nitrite_Nitrate_NO2_NO3_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	289	1.33	.00250	10.00	1.70	0.10	127	0.02	0.28	0.76	1.68	4.61
SPRING	278	1.10	.00000	8.22	1.29	0.08	117	0.02	0.24	0.65	1.39	3.80
SUMMER	350	0.97	.00000	10.50	1.35	0.07	140	0.01	0.13	0.56	1.19	3.30
WINTER	260	1.57	.00000	9.28	1.63	0.10	104	0.03	0.45	0.99	1.92	4.90

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
Nitrogen_Tot_Kjeldhal_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	235	0.82	.00000	5.37	0.71	0.05	87	0.14	0.40	0.65	0.95	1.97
SPRING	267	0.89	.00000	5.70	0.69	0.04	78	0.20	0.50	0.71	1.06	1.96
SUMMER	332	1.02	.00000	5.10	0.73	0.04	72	0.27	0.56	0.82	1.26	2.58
WINTER	237	0.75	.00000	6.75	0.73	0.05	98	0.15	0.37	0.56	0.80	2.30

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1999 to 2000
Organic_P_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	42	32.54	1.5100	99.08	27.12	4.18	83	3.17	12.39	20.97	49.31	87.01
SPRING	21	67.56	1.8400	177.15	53.56	11.69	79	2.15	17.35	69.94	104.97	154.83
SUMMER	41	93.42	4.3300	348.11	79.09	12.35	85	23.13	46.81	65.55	128.74	221.74

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1992
Phosph_Ortho_Tot_as_P_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	25	155.20	5.0000	2200.00	431.20	86.24	278	5.00	20.00	35.00	135.00	230.00
SPRING	23	166.79	5.0000	2050.00	419.60	87.49	252	10.00	21.25	65.00	120.00	400.00
SUMMER	25	146.20	8.7500	1400.00	279.08	55.82	191	12.50	27.50	40.00	192.50	330.00
WINTER	24	205.78	5.0000	2900.00	581.87	118.77	283	5.00	9.38	51.25	150.00	350.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
Total_Nitrogen_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	68	2.06	.20000	9.50	1.78	0.22	87	0.40	0.95	1.41	2.83	5.55
SPRING	54	1.85	.16000	9.23	1.55	0.21	84	0.34	1.00	1.34	2.20	4.87
SUMMER	94	1.64	.26000	10.20	1.43	0.15	88	0.45	0.79	1.30	2.04	3.64
WINTER	52	1.83	.25000	12.00	1.79	0.25	98	0.44	0.81	1.41	2.15	4.55

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
Total_Phosphorus_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	380	280.02	.00000	2075.00	345.56	17.73	123	20.00	65.00	150.00	340.00	1080.0
SPRING	403	276.81	2.5000	2115.00	337.56	16.81	122	20.00	70.00	160.84	340.00	990.00
SUMMER	489	319.26	.00000	2350.00	371.78	16.81	116	20.00	80.00	190.00	415.00	1130.0
WINTER	334	253.14	.00000	2950.00	390.19	21.35	154	10.00	40.00	110.00	260.00	1100.0

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1998
Turbidity_FTU

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	165	21.14	1.9500	160.00	22.54	1.75	107	2.60	6.08	14.00	27.00	63.00
SPRING	167	24.95	1.0000	136.00	22.31	1.73	89	3.78	9.58	20.00	30.50	69.75
SUMMER	179	33.74	1.2500	127.00	27.16	2.03	80	3.00	10.50	27.43	50.50	81.00
WINTER	155	15.30	1.0000	123.50	21.21	1.70	139	2.00	4.80	9.05	13.65	69.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1993
Turbidity_JCU

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	15	29.25	.50000	137.00	38.81	10.02	133	0.50	3.65	17.00	32.55	137.00
SPRING	23	50.44	3.0000	163.00	47.63	9.93	94	5.90	10.00	25.00	92.55	121.50
SUMMER	41	39.56	.25000	140.00	42.03	6.56	106	2.25	7.40	22.50	54.00	128.50
WINTER	32	19.18	4.3500	69.00	15.03	2.66	78	5.05	10.00	15.00	24.63	52.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
Turbidity_NTU

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	78	35.30	1.0000	230.00	40.07	4.54	113	3.00	11.00	24.68	43.60	104.00
SPRING	37	74.47	2.0000	941.00	152.60	25.09	205	3.00	16.00	42.00	72.00	179.00
SUMMER	105	60.67	2.0000	492.00	68.13	6.65	112	3.00	19.40	49.00	74.20	157.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
pH_S_U

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	64	8.14	5.3200	8.82	0.44	0.06	5	7.70	8.00	8.24	8.30	8.55
SPRING	43	8.18	6.8100	9.70	0.45	0.07	5	7.57	7.90	8.20	8.41	8.66
SUMMER	70	8.44	7.4500	9.59	0.54	0.06	6	7.65	8.00	8.38	8.78	9.35
WINTER	17	7.99	7.1600	8.55	0.36	0.09	5	7.16	7.80	8.00	8.13	8.55

Data were not always available for all years.

APPENDIX B

Descriptive Statistics Data Tables for Level III Subecoregions Within Aggregate Ecoregion

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1999 to 2000
Chloro_A_Fluor_cor_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	19	5.00	1.0000	19.00	5.54	1.27	111	1.00	1.55	1.90	7.20	19.0
25	SPRING	10	9.81	1.1700	50.89	14.9	4.70	151	1.17	3.04	4.56	9.68	50.9
25	SUMMER	20	12.55	.37000	67.80	19.6	4.38	156	0.37	3.08	5.85	11.3	67.8
27	FALL	16	6.09	.70000	11.50	4.06	1.02	67	0.70	1.75	7.03	9.50	11.5
27	SPRING	8	8.97	.28000	37.98	12.2	4.32	136	0.28	2.51	5.26	8.97	38.0
27	SUMMER	14	29.21	8.8000	58.20	17.2	4.60	59	8.80	15.6	25.4	44.4	58.2
42	FALL	7	4.47	3.2000	7.90	1.62	0.61	36	3.20	3.20	3.90	4.60	7.90
42	SPRING	3	3.86	.03000	6.70	3.44	1.99	89	0.03	0.03	4.84	6.70	6.70
42	SUMMER	7	34.13	8.1000	62.69	24.5	9.27	72	8.10	8.10	22.3	62.7	62.7

Data were not always available for all years.

Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1999 to 2000
Chloro_A_Pheo_cor_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	10	2.43	.50000	6.80	1.86	0.59	76	0.50	1.20	2.10	3.40	6.80
25	SPRING	10	4.44	1.2300	19.78	5.58	1.77	126	1.23	1.77	2.71	3.21	19.8
25	SUMMER	10	5.66	1.9000	13.00	3.28	1.04	58	1.90	2.92	5.23	6.98	13.0
27	FALL	8	4.33	.70000	7.60	2.61	0.92	60	0.70	2.30	3.95	6.90	7.60
27	SPRING	8	4.45	.19000	15.90	5.46	1.93	123	0.19	0.85	2.04	6.87	15.9
27	SUMMER	8	15.51	4.1000	41.40	12.8	4.51	82	4.10	6.00	11.4	21.9	41.4
42	FALL	3	2.67	2.3000	3.20	0.47	0.27	18	2.30	2.30	2.50	3.20	3.20
42	SPRING	3	2.14	.05000	3.48	1.83	1.06	86	0.05	0.05	2.88	3.48	3.48
42	SUMMER	3	9.02	6.2000	12.35	3.11	1.79	34	6.20	6.20	8.51	12.4	12.4

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1996
Chloro_A_Phyto_Spec_A_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	5	6.76	.25000	13.27	5.15	2.30	76	0.25	4.74	5.00	10.5	13.3
25	SPRING	8	12.38	1.5250	30.70	8.54	3.02	69	1.53	8.44	10.1	14.9	30.7
25	SUMMER	12	19.35	.25000	44.10	16.1	4.64	83	0.25	5.43	13.8	34.5	44.1
25	WINTER	5	5.37	.25000	21.50	9.06	4.05	169	0.25	0.88	1.63	2.60	21.5
27	FALL	22	7.16	.25000	27.60	8.58	1.83	120	0.25	0.50	4.07	9.20	24.5
27	SPRING	27	12.12	.25000	116.00	22.6	4.35	187	0.25	2.00	4.81	15.8	38.4
27	SUMMER	32	16.52	.25000	71.20	19.6	3.47	119	0.25	1.89	7.37	26.9	64.0
27	WINTER	25	4.14	.25000	21.90	5.03	1.01	121	0.25	0.64	3.20	4.15	13.6
32	FALL	51	3.29	.25000	42.20	6.65	0.93	202	0.25	0.25	0.50	3.28	10.4
32	SPRING	58	3.77	.25000	22.08	4.84	0.64	129	0.25	0.25	1.33	5.80	15.6
32	SUMMER	66	7.78	.25000	128.00	18.1	2.23	233	0.25	0.50	2.06	6.36	37.0
32	WINTER	45	2.73	.25000	14.60	3.01	0.45	110	0.25	0.25	1.91	3.72	8.70

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
DIP_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	19	239.64	10.000	1875.00	446	102	186	10.0	23.8	32.5	268	1875
25	SPRING	10	361.88	12.500	1375.00	426	135	118	12.5	30.0	220	615	1375
25	SUMMER	20	160.61	5.8800	1150.00	268	59.9	167	9.62	23.7	47.7	195	838
25	WINTER	10	564.63	6.2500	2100.00	669	211	118	6.25	42.5	275	938	2100
27	FALL	26	133.56	5.0000	840.00	184	36.0	138	5.73	20.0	60.4	175	396
27	SPRING	18	121.88	5.0000	875.00	198	46.7	162	5.00	12.5	75.0	145	875
27	SUMMER	24	104.96	5.0000	1100.00	219	44.7	208	5.00	12.5	57.5	103	205
27	WINTER	18	101.39	5.0000	432.50	103	24.2	101	5.00	7.50	91.3	145	433
32	FALL	6	151.67	10.000	640.00	243	99.0	160	10.0	30.0	55.0	120	640
32	SPRING	6	147.92	7.5000	765.00	303	124	205	7.50	10.0	25.0	55.0	765
32	SUMMER	6	193.33	6.2500	1062.50	426	174	220	6.25	6.25	13.8	57.5	1063
32	WINTER	6	177.71	7.5000	780.00	300	123	169	7.50	13.8	63.8	138	780
42	FALL	11	120.73	5.0000	992.50	291	87.7	241	5.00	5.00	26.8	78.7	993
42	SPRING	8	137.97	5.0000	553.00	194	68.7	141	5.00	13.8	44.4	215	553
42	SUMMER	11	226.28	5.0000	1660.00	509	153	225	5.00	7.50	15.9	100	1660
42	WINTER	9	46.89	5.0000	208.00	65.9	22.0	140	5.00	11.0	16.3	61.0	208

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1998 to 1998
Dissolved_Oxygen_percent_sat

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	SUMMER	1	138.03	138.03	138.03	.	.	.	138	138	138	138	138

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
Dissolved_Oxygen_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	52	9.30	3.3000	13.20	1.66	0.23	18	5.30	8.73	9.50	10.1	11.5
25	SPRING	78	9.35	.70000	12.60	1.75	0.20	19	6.70	8.70	9.33	10.3	11.8
25	SUMMER	82	7.74	.70000	11.80	1.71	0.19	22	3.45	7.50	7.91	8.45	10.0
25	WINTER	54	11.08	5.6000	12.83	1.28	0.17	12	9.40	10.5	11.3	12.1	12.5
27	FALL	199	8.75	.40000	13.70	2.01	0.14	23	4.30	7.80	9.05	10.1	11.4
27	SPRING	189	9.04	.80000	14.00	1.63	0.12	18	6.50	8.25	9.15	10.0	11.2
27	SUMMER	241	7.36	2.0000	12.50	1.53	0.10	21	5.10	6.40	7.25	8.23	10.1
27	WINTER	174	11.74	8.1000	14.20	1.16	0.09	10	9.30	11.2	11.8	12.5	13.6
32	FALL	67	7.68	1.4000	10.60	1.60	0.20	21	4.20	7.10	8.10	8.70	9.20
32	SPRING	89	8.27	4.1000	11.00	1.15	0.12	14	6.00	7.78	8.40	9.00	10.4
32	SUMMER	85	7.01	3.6000	11.05	1.40	0.15	20	4.80	6.00	7.00	7.90	9.10
32	WINTER	79	10.23	8.0000	13.10	1.15	0.13	11	8.20	9.30	10.2	11.0	12.5
42	FALL	10	10.44	7.6000	11.85	1.26	0.40	12	7.60	10.1	10.8	11.3	11.9
42	SPRING	23	10.07	5.9500	13.05	1.91	0.40	19	6.70	8.08	10.5	11.2	12.5
42	SUMMER	38	8.13	3.8750	12.10	1.69	0.27	21	4.70	7.60	8.26	9.10	11.1
42	WINTER	9	11.32	6.6000	16.09	2.48	0.83	22	6.60	10.7	10.9	12.1	16.1

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	54	2.09	.01000	5.65	1.66	0.23	79	0.06	0.81	1.69	3.33	4.88
25	SPRING	49	2.04	.00000	6.13	1.72	0.25	84	0.00	0.63	1.73	3.15	5.66
25	SUMMER	61	1.30	.00000	4.98	1.27	0.16	98	0.00	0.37	0.96	1.75	3.78
25	WINTER	35	2.98	.00000	6.80	2.00	0.34	67	0.01	1.38	2.62	4.70	6.65
27	FALL	166	0.98	.00500	10.00	1.28	0.10	131	0.03	0.21	0.62	1.20	2.77
27	SPRING	157	0.79	.00500	3.79	0.76	0.06	96	0.03	0.17	0.58	1.16	2.50
27	SUMMER	201	0.83	.00000	10.50	1.17	0.08	141	0.01	0.13	0.52	1.04	2.43
27	WINTER	161	1.29	.00500	8.95	1.25	0.10	97	0.04	0.44	0.92	1.76	3.58
32	FALL	50	1.80	.00250	9.40	2.55	0.36	142	0.02	0.30	0.93	1.82	8.95
32	SPRING	51	1.50	.01000	8.22	1.70	0.24	113	0.17	0.48	0.99	1.93	4.55
32	SUMMER	50	1.10	.00250	6.60	1.40	0.20	128	0.02	0.21	0.60	1.28	5.02
32	WINTER	52	1.72	.02500	9.28	1.98	0.27	115	0.19	0.52	0.82	1.87	6.35
42	FALL	19	1.07	.01000	4.61	1.38	0.32	130	0.01	0.15	0.60	1.75	4.61
42	SPRING	21	0.31	.01000	2.10	0.46	0.10	150	0.01	0.06	0.16	0.40	0.81
42	SUMMER	38	0.96	.00000	8.44	2.06	0.33	214	0.00	0.02	0.10	0.71	6.92
42	WINTER	12	0.48	.01000	1.24	0.50	0.15	105	0.01	0.07	0.18	0.97	1.24

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	59	1.07	.00000	4.85	0.92	0.12	86	0.01	0.53	0.80	1.50	2.95
25	SPRING	69	1.15	.00000	5.70	1.01	0.12	87	0.24	0.60	0.80	1.48	3.05
25	SUMMER	73	0.96	.00000	3.60	0.76	0.09	79	0.00	0.55	0.75	1.10	3.00
25	WINTER	56	1.19	.00000	6.75	1.20	0.16	101	0.13	0.45	0.72	1.73	3.20
27	FALL	96	0.78	.05000	5.37	0.69	0.07	88	0.14	0.44	0.65	0.90	1.63
27	SPRING	88	0.90	.05000	3.72	0.57	0.06	64	0.19	0.60	0.80	1.00	1.96
27	SUMMER	139	1.10	.05000	5.10	0.68	0.06	61	0.33	0.68	0.90	1.42	2.35
27	WINTER	90	0.63	.07500	1.81	0.30	0.03	47	0.26	0.43	0.60	0.77	1.33
32	FALL	65	0.62	.12000	2.35	0.38	0.05	60	0.23	0.35	0.59	0.77	1.25
32	SPRING	89	0.66	.05000	2.38	0.38	0.04	57	0.23	0.40	0.60	0.78	1.44
32	SUMMER	84	0.76	.14250	2.80	0.54	0.06	71	0.25	0.40	0.60	0.89	2.00
32	WINTER	80	0.58	.05000	3.78	0.54	0.06	94	0.09	0.30	0.43	0.70	1.33
42	FALL	15	0.95	.20000	3.40	0.83	0.21	87	0.20	0.50	0.70	1.00	3.40
42	SPRING	21	1.02	.10000	2.88	0.62	0.14	61	0.20	0.60	1.10	1.40	1.54
42	SUMMER	36	1.46	.28000	4.00	1.01	0.17	69	0.30	0.88	1.10	1.78	4.00
42	WINTER	11	0.70	.34000	1.50	0.34	0.10	49	0.34	0.50	0.63	0.75	1.50

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1999 to 2000
Organic_P_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	19	17.34	1.5100	87.01	19.6	4.51	113	1.51	6.24	12.4	21.0	87.0
25	SPRING	10	38.64	1.8400	154.83	53.9	17.0	140	1.84	8.61	14.8	40.1	155
25	SUMMER	20	103.22	4.3300	348.11	105	23.6	102	4.33	29.3	65.2	157	348
27	FALL	16	51.05	13.710	99.08	24.9	6.23	49	13.7	37.9	45.0	65.0	99.1
27	SPRING	8	91.13	31.850	177.15	44.0	15.6	48	31.9	61.9	88.1	110	177
27	SUMMER	14	73.14	38.590	149.17	36.5	9.75	50	38.6	51.0	57.2	96.3	149
42	FALL	7	31.50	4.1000	59.50	25.9	9.79	82	4.10	4.10	18.5	59.5	59.5
42	SPRING	3	101.14	76.890	130.27	27.0	15.6	27	76.9	76.9	96.3	130	130
42	SUMMER	7	105.99	46.810	177.75	46.9	17.7	44	46.8	46.8	107	129	178

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1992
Phosph_Ortho_Tot_as_P_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	4	576.88	5.0000	2200.00	1082	541	188	5.00	17.5	51.3	1136	2200
25	SPRING	4	547.50	12.500	2050.00	1002	501	183	12.5	27.5	63.8	1068	2050
25	SUMMER	4	406.25	35.000	1400.00	664	332	163	35.0	42.5	95.0	770	1400
25	WINTER	3	1098.33	45.000	2900.00	1568	905	143	45.0	45.0	350	2900	2900
27	FALL	13	88.08	5.0000	230.00	80.2	22.2	91	5.00	20.0	70.0	140	230
27	SPRING	11	114.43	5.0000	400.00	113	34.2	99	5.00	21.3	82.5	175	400
27	SUMMER	13	132.02	8.7500	330.00	120	33.2	91	8.75	27.5	70.0	235	330
27	WINTER	13	89.33	5.0000	280.00	93.1	25.8	104	5.00	8.75	57.5	130	280
32	FALL	3	75.00	20.000	135.00	57.7	33.3	77	20.0	20.0	70.0	135	135
32	SPRING	3	55.00	15.000	85.00	36.1	20.8	66	15.0	15.0	65.0	85.0	85.0
32	SUMMER	3	55.83	12.500	125.00	60.5	35.0	108	12.5	12.5	30.0	125	125
32	WINTER	3	106.67	20.000	170.00	77.7	44.8	73	20.0	20.0	130	170	170
42	FALL	5	40.50	5.0000	120.00	46.1	20.6	114	5.00	12.5	30.0	35.0	120
42	SPRING	5	44.50	10.000	120.00	43.5	19.5	98	10.0	25.0	27.5	40.0	120
42	SUMMER	5	29.25	17.500	45.00	11.5	5.15	39	17.5	18.8	30.0	35.0	45.0
42	WINTER	5	32.50	5.0000	120.00	49.2	22.0	152	5.00	7.50	10.0	20.0	120

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
Total_Nitrogen_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	23	3.01	.40000	9.50	2.59	0.54	86	0.40	1.06	2.60	4.27	7.34
25	SPRING	14	2.95	.16000	9.23	2.56	0.68	87	0.16	0.67	2.94	4.35	9.23
25	SUMMER	24	2.25	.58000	7.45	1.71	0.35	76	0.58	1.07	1.42	3.59	4.66
25	WINTER	4	6.09	3.1000	12.00	4.01	2.00	66	3.10	3.83	4.63	8.35	12.0
27	FALL	30	1.60	.20000	3.00	0.89	0.16	55	0.30	0.90	1.47	2.71	2.99
27	SPRING	28	1.50	.30000	2.89	0.70	0.13	47	0.34	1.01	1.45	1.93	2.86
27	SUMMER	54	1.45	.26000	10.20	1.41	0.19	97	0.34	0.72	1.13	1.83	2.72
27	WINTER	40	1.51	.25000	4.47	0.92	0.15	61	0.44	0.79	1.38	2.00	3.44
32	FALL	2	1.60	1.6000	1.60	0.00	0.00	0	1.60	1.60	1.60	1.60	1.60
32	SPRING	3	1.08	.78500	1.25	0.26	0.15	24	0.79	0.79	1.20	1.25	1.25
32	SUMMER	3	1.18	.50000	2.20	0.90	0.52	76	0.50	0.50	0.84	2.20	2.20
32	WINTER	3	1.56	.91000	2.60	0.91	0.53	59	0.91	0.91	1.16	2.60	2.60
42	FALL	13	1.49	.50000	3.97	0.98	0.27	66	0.50	0.95	1.17	1.95	3.97
42	SPRING	9	1.45	.70000	2.98	0.73	0.24	50	0.70	1.11	1.23	1.40	2.98
42	SUMMER	13	1.38	.60000	2.95	0.64	0.18	46	0.60	0.98	1.37	1.40	2.95
42	WINTER	5	1.20	.42500	1.85	0.63	0.28	53	0.43	0.75	1.15	1.80	1.85

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
Total_Phosphorus_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	84	264.00	.00000	2075.00	374	40.8	142	20.0	44.0	118	290	918
25	SPRING	89	341.04	9.0000	1900.00	395	41.9	116	28.5	70.0	185	490	995
25	SUMMER	103	255.37	.00000	1640.00	284	28.0	111	20.0	89.7	165	350	690
25	WINTER	61	433.09	.00000	2950.00	583	74.6	135	10.0	50.0	170	600	1550
27	FALL	199	275.07	10.000	1800.00	300	21.2	109	30.0	90.0	168	375	990
27	SPRING	190	267.40	2.5000	2115.00	308	22.4	115	20.0	90.0	194	325	870
27	SUMMER	246	365.09	.00000	2350.00	380	24.2	104	50.0	115	259	445	1130
27	WINTER	177	194.86	3.7500	1640.00	264	19.9	136	15.0	50.0	118	206	690
32	FALL	71	357.83	10.000	1600.00	441	52.3	123	16.3	50.0	115	510	1245
32	SPRING	94	250.36	2.5000	1880.00	357	36.8	142	20.0	50.0	113	270	1110
32	SUMMER	90	280.19	2.5000	2115.00	435	45.9	155	20.0	40.0	75.0	305	1300
32	WINTER	82	269.75	2.5000	2170.00	429	47.4	159	10.0	30.0	70.0	295	1390
42	FALL	26	157.22	2.5000	1080.00	235	46.1	149	8.13	40.0	81.5	138	630
42	SPRING	30	228.74	20.000	1060.50	247	45.0	108	20.0	41.5	165	300	740
42	SUMMER	50	295.76	4.0000	1780.00	346	48.9	117	20.0	55.5	180	380	930
42	WINTER	14	108.50	8.7500	420.00	127	33.9	117	8.75	16.0	57.5	165	420

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1998
Turbidity_FTU

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	16	13.65	2.5000	63.00	17.0	4.25	125	2.50	3.33	6.56	14.7	63.0
25	SPRING	16	13.82	3.0000	36.25	10.7	2.66	77	3.00	6.80	9.65	20.3	36.3
25	SUMMER	16	25.25	3.0000	94.93	30.0	7.50	119	3.00	5.38	8.88	41.8	94.9
25	WINTER	16	11.21	2.0000	52.00	13.0	3.24	116	2.00	3.35	7.60	11.8	52.0
27	FALL	122	20.74	2.5000	160.00	21.1	1.91	102	3.45	7.00	14.9	25.8	50.5
27	SPRING	119	23.82	3.0000	112.50	17.5	1.61	74	5.00	11.0	20.4	29.0	62.7
27	SUMMER	133	37.75	1.2500	127.00	26.3	2.28	70	5.00	17.8	34.0	52.1	81.0
27	WINTER	110	11.25	1.0000	100.50	12.8	1.22	113	2.15	4.80	8.78	11.9	27.9
32	FALL	20	29.75	1.9500	95.00	30.6	6.84	103	2.23	3.95	14.3	55.6	87.5
32	SPRING	25	37.55	1.0000	136.00	38.4	7.68	102	1.70	10.8	25.1	59.0	108
32	SUMMER	23	18.96	2.0000	120.00	26.6	5.54	140	2.10	3.00	10.6	26.0	66.0
32	WINTER	23	35.84	1.9500	123.50	36.8	7.67	103	2.20	8.50	19.5	69.0	102
42	FALL	7	20.67	2.0000	82.00	28.5	10.8	138	2.00	2.50	12.5	27.5	82.0
42	SPRING	7	24.58	2.5500	69.75	23.1	8.74	94	2.55	3.00	20.8	33.0	69.8
42	SUMMER	7	25.61	2.3000	51.00	18.6	7.01	72	2.30	3.00	24.5	44.0	51.0
42	WINTER	6	21.80	2.9000	99.00	38.0	15.5	174	2.90	4.75	5.59	13.0	99.0

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1993
Turbidity_JCU

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
27	FALL	15	29.25	.50000	137.00	38.8	10.0	133	0.50	3.65	17.0	32.6	137
27	SPRING	23	50.44	3.0000	163.00	47.6	9.93	94	5.90	10.0	25.0	92.6	122
27	SUMMER	33	42.63	2.0500	137.50	41.0	7.14	96	2.25	14.5	29.0	63.0	129
27	WINTER	32	19.18	4.3500	69.00	15.0	2.66	78	5.05	10.0	15.0	24.6	52.0
42	SUMMER	8	26.91	.25000	140.00	46.6	16.5	173	0.25	4.50	8.20	24.8	140

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
Turbidity_NTU

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	22	29.82	1.0000	72.50	21.9	4.68	74	1.00	12.6	28.0	47.0	66.0
25	SPRING	14	88.54	2.0000	941.00	246	65.8	278	2.00	5.60	19.0	42.0	941
25	SUMMER	24	90.61	2.0000	492.00	117	23.9	129	2.00	26.1	54.8	77.8	343
27	FALL	48	35.61	3.0000	230.00	47.2	6.81	133	7.00	10.0	20.4	42.8	137
27	SPRING	20	61.54	3.0000	179.00	44.7	9.99	73	5.90	36.6	49.4	84.1	157
27	SUMMER	68	50.39	2.0000	157.00	35.9	4.36	71	5.50	22.1	46.2	73.3	118
42	FALL	8	48.51	2.1000	104.00	31.0	11.0	64	2.10	30.0	43.0	68.0	104
42	SPRING	3	95.00	45.000	142.00	48.6	28.0	51	45.0	45.0	98.0	142	142
42	SUMMER	13	59.17	2.0000	192.50	66.4	18.4	112	2.00	8.00	15.5	120	193

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
pH_S_U

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	FALL	27	8.19	7.7000	8.39	0.16	0.03	2	7.99	8.05	8.25	8.30	8.39
25	SPRING	17	8.36	7.9000	9.70	0.44	0.11	5	7.90	8.05	8.30	8.53	9.70
25	SUMMER	28	8.48	7.8000	9.59	0.55	0.10	6	7.84	8.04	8.31	8.89	9.49
25	WINTER	7	8.13	7.8000	8.40	0.21	0.08	3	7.80	8.00	8.10	8.40	8.40
27	FALL	21	8.15	7.7700	8.55	0.25	0.05	3	7.77	7.94	8.20	8.36	8.46
27	SPRING	13	8.16	7.8000	8.50	0.24	0.07	3	7.80	8.00	8.16	8.35	8.50
27	SUMMER	19	8.35	7.5400	9.35	0.48	0.11	6	7.54	7.95	8.38	8.63	9.35
27	WINTER	5	8.15	7.6750	8.55	0.36	0.16	4	7.68	7.93	8.13	8.45	8.55
32	FALL	3	7.75	7.5500	7.90	0.18	0.10	2	7.55	7.55	7.80	7.90	7.90
32	SPRING	3	7.70	7.5000	7.80	0.17	0.10	2	7.50	7.50	7.80	7.80	7.80
32	SUMMER	3	7.63	7.4500	7.80	0.18	0.10	2	7.45	7.45	7.65	7.80	7.80
32	WINTER	3	7.85	7.7000	7.95	0.13	0.08	2	7.70	7.70	7.90	7.95	7.95
42	FALL	13	8.10	5.3200	8.82	0.91	0.25	11	5.32	8.14	8.30	8.43	8.82
42	SPRING	10	8.03	6.8100	8.66	0.58	0.18	7	6.81	7.74	8.16	8.50	8.66
42	SUMMER	20	8.58	7.5500	9.30	0.53	0.12	6	7.64	8.26	8.64	8.88	9.30
42	WINTER	2	7.33	7.1600	7.50	0.24	0.17	3	7.16	7.16	7.33	7.50	7.50

Data were not always available for all years.

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1999 to 2000
Chloro_A_Fluor_cor_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1999	FALL	19	5.00	1.0000	19.00	5.54	1.27	111	1.00	1.55	1.90	7.20	19.00
25	1999	SUMMER	20	12.55	.37000	67.80	19.59	4.38	156	0.37	3.08	5.85	11.28	67.80
25	2000	SPRING	10	9.81	1.1700	50.89	14.86	4.70	151	1.17	3.04	4.56	9.68	50.89
27	1999	FALL	16	6.09	.70000	11.50	4.06	1.02	67	0.70	1.75	7.03	9.50	11.50
27	1999	SUMMER	14	29.21	8.8000	58.20	17.21	4.60	59	8.80	15.60	25.35	44.40	58.20
27	2000	SPRING	8	8.97	.28000	37.98	12.22	4.32	136	0.28	2.51	5.26	8.97	37.98
42	1999	FALL	7	4.47	3.2000	7.90	1.62	0.61	36	3.20	3.20	3.90	4.60	7.90
42	1999	SUMMER	7	34.13	8.1000	62.69	24.51	9.27	72	8.10	8.10	22.35	62.69	62.69
42	2000	SPRING	3	3.86	.03000	6.70	3.44	1.99	89	0.03	0.03	4.84	6.70	6.70

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1999 to 2000
Chloro_A_Pheo_cor_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1999	FALL	10	2.43	.50000	6.80	1.86	0.59	76	0.50	1.20	2.10	3.40	6.80
25	1999	SUMMER	10	5.66	1.9000	13.00	3.28	1.04	58	1.90	2.92	5.23	6.98	13.00
25	2000	SPRING	10	4.44	1.2300	19.78	5.58	1.77	126	1.23	1.77	2.71	3.21	19.78
27	1999	FALL	8	4.33	.70000	7.60	2.61	0.92	60	0.70	2.30	3.95	6.90	7.60
27	1999	SUMMER	8	15.51	4.1000	41.40	12.76	4.51	82	4.10	6.00	11.40	21.90	41.40
27	2000	SPRING	8	4.45	.19000	15.90	5.46	1.93	123	0.19	0.85	2.04	6.87	15.90
42	1999	FALL	3	2.67	2.3000	3.20	0.47	0.27	18	2.30	2.30	2.50	3.20	3.20
42	1999	SUMMER	3	9.02	6.2000	12.35	3.11	1.79	34	6.20	6.20	8.51	12.35	12.35
42	2000	SPRING	3	2.14	.05000	3.48	1.83	1.06	86	0.05	0.05	2.88	3.48	3.48

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1996
Chloro_A_Phyto_Spec_A_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1990	FALL	3	11.77	.25000	22.00	10.93	6.31	93	0.25	0.25	13.05	22.00	22.00
25	1990	SPRING	5	20.95	.25000	55.50	22.35	9.99	107	0.25	8.20	10.10	30.70	55.50
25	1990	SUMMER	9	24.07	3.3500	69.30	21.33	7.11	89	3.35	9.00	15.65	29.40	69.30
25	1990	WINTER	3	13.54	1.3250	29.90	14.73	8.50	109	1.33	1.33	9.40	29.90	29.90
25	1991	FALL	3	5.03	2.1000	8.00	2.95	1.70	59	2.10	2.10	5.00	8.00	8.00
25	1991	SPRING	4	55.66	2.8000	157.00	71.08	35.54	128	2.80	6.40	31.41	104.91	157.00
25	1991	SUMMER	5	23.13	2.9250	58.70	24.78	11.08	107	2.93	5.00	9.50	39.50	58.70
25	1991	WINTER	2	18.69	.87500	36.50	25.19	17.81	135	0.88	0.88	18.69	36.50	36.50
25	1992	FALL	3	26.23	3.6000	49.90	23.17	13.38	88	3.60	3.60	25.20	49.90	49.90
25	1992	SPRING	2	20.00	5.7000	34.30	20.22	14.30	101	5.70	5.70	20.00	34.30	34.30
25	1992	SUMMER	4	33.89	3.8000	79.00	35.47	17.73	105	3.80	5.60	26.38	62.18	79.00
25	1992	WINTER	3	9.98	.25000	27.10	14.87	8.59	149	0.25	0.25	2.60	27.10	27.10
25	1993	FALL	3	9.13	.25000	19.76	9.87	5.70	108	0.25	0.25	7.37	19.76	19.76
25	1993	SPRING	2	11.73	.25000	23.20	16.23	11.48	138	0.25	0.25	11.73	23.20	23.20
25	1993	SUMMER	2	14.23	5.8600	22.60	11.84	8.37	83	5.86	5.86	14.23	22.60	22.60
25	1993	WINTER	3	1.17	.25000	3.00	1.59	0.92	136	0.25	0.25	0.25	3.00	3.00
25	1994	FALL	4	7.54	.25000	22.87	10.68	5.34	142	0.25	0.25	3.51	14.82	22.87
25	1994	SPRING	3	4.80	.25000	13.90	7.88	4.55	164	0.25	0.25	0.25	13.90	13.90
25	1994	SUMMER	3	7.57	.25000	22.20	12.67	7.32	167	0.25	0.25	0.25	22.20	22.20
25	1994	WINTER	1	6.39	6.3900	6.39	.	.	.	6.39	6.39	6.39	6.39	6.39
25	1995	FALL	2	4.60	.25000	8.95	6.15	4.35	134	0.25	0.25	4.60	8.95	8.95
25	1995	SPRING	3	8.72	7.7400	9.73	0.99	0.57	11	7.74	7.74	8.68	9.73	9.73
25	1995	SUMMER	4	30.72	.25000	96.70	45.59	22.80	148	0.25	0.25	12.96	61.19	96.70
25	1995	WINTER	4	6.17	.25000	21.50	10.25	5.12	166	0.25	0.57	1.47	11.78	21.50
25	1996	SPRING	3	24.82	5.7700	59.95	30.46	17.59	123	5.77	5.77	8.73	59.95	59.95
25	1996	SUMMER	4	9.65	.25000	24.30	11.67	5.83	121	0.25	0.25	7.03	19.05	24.30
25	1996	WINTER	4	0.25	.25000	0.25	0.00	0.00	0	0.25	0.25	0.25	0.25	0.25
27	1990	FALL	5	10.33	.50000	27.60	10.93	4.89	106	0.50	2.63	7.00	13.90	27.60
27	1990	SPRING	6	25.85	1.6000	120.00	46.64	19.04	180	1.60	3.75	4.51	20.70	120.00
27	1990	SUMMER	12	17.67	.25000	71.20	19.55	5.64	111	0.25	5.25	13.25	24.53	71.20
27	1990	WINTER	11	12.70	.25000	87.30	25.10	7.57	198	0.25	1.90	4.00	10.60	87.30
27	1991	FALL	3	1.67	.50000	4.00	2.02	1.17	121	0.50	0.50	0.50	4.00	4.00

Aggregate Nutrient Ecoregion: V
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from 1990 to 1996
Chloro_A_Phyto_Spec_A_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
27	1991	SPRING	9	9.53	.50000	25.25	9.12	3.04	96	0.50	2.00	5.60	15.80	25.25
27	1991	SUMMER	12	14.44	.25000	48.60	15.70	4.53	109	0.25	0.73	10.85	24.70	48.60
27	1991	WINTER	3	3.08	.50000	5.75	2.63	1.52	85	0.50	0.50	3.00	5.75	5.75
27	1992	FALL	4	27.86	.25000	42.40	18.89	9.45	68	0.25	16.13	34.40	39.60	42.40
27	1992	SPRING	7	5.18	.50000	10.20	3.85	1.46	74	0.50	0.50	4.80	9.50	10.20
27	1992	SUMMER	23	19.05	.25000	93.60	24.67	5.14	130	0.50	3.00	10.60	22.00	67.20
27	1992	WINTER	3	1.25	.25000	3.00	1.52	0.88	122	0.25	0.25	0.50	3.00	3.00
27	1993	FALL	8	5.75	.25000	18.70	7.32	2.59	127	0.25	0.38	2.81	10.36	18.70
27	1993	SPRING	10	8.33	.25000	25.60	9.00	2.85	108	0.25	2.00	5.08	18.00	25.60
27	1993	SUMMER	17	26.51	.25000	152.00	38.87	9.43	147	0.25	3.65	10.80	27.75	152.00
27	1993	WINTER	7	6.28	.25000	25.00	8.97	3.39	143	0.25	0.25	3.44	10.40	25.00
27	1994	FALL	16	2.89	.25000	18.00	5.07	1.27	176	0.25	0.25	0.25	2.72	18.00
27	1994	SPRING	19	14.52	.25000	132.00	33.13	7.60	228	0.25	0.25	2.20	12.81	132.00
27	1994	SUMMER	10	10.66	.25000	52.50	15.82	5.00	148	0.25	0.25	6.18	12.00	52.50
27	1994	WINTER	11	2.54	.25000	7.84	2.74	0.83	108	0.25	0.25	0.50	4.74	7.84
27	1995	FALL	18	9.44	.25000	39.88	10.07	2.37	107	0.25	1.14	7.57	12.60	39.88
27	1995	SPRING	17	8.32	.25000	41.60	13.85	3.36	166	0.25	0.25	0.25	10.00	41.60
27	1995	SUMMER	17	4.27	.25000	26.70	7.60	1.84	178	0.25	0.25	0.25	6.60	26.70
27	1995	WINTER	13	1.61	.25000	6.14	1.95	0.54	121	0.25	0.25	0.25	3.20	6.14
27	1996	SPRING	17	19.60	.25000	116.00	29.72	7.21	152	0.25	2.76	7.04	21.90	116.00
27	1996	SUMMER	17	33.47	.25000	143.00	40.63	9.85	121	0.25	4.41	20.30	37.35	143.00
27	1996	WINTER	18	5.33	.25000	21.90	5.76	1.36	108	0.25	1.15	4.12	7.93	21.90
32	1990	FALL	12	1.28	.25000	3.80	1.28	0.37	100	0.25	0.25	0.63	2.20	3.80
32	1990	SPRING	15	4.55	.25000	22.90	6.05	1.56	133	0.25	0.50	2.08	7.00	22.90
32	1990	SUMMER	32	5.20	.25000	30.20	6.98	1.23	134	0.25	0.50	2.93	6.40	23.90
32	1990	WINTER	13	6.53	.25000	25.10	7.37	2.05	113	0.25	1.00	4.00	8.70	25.10
32	1991	FALL	12	2.58	.25000	8.60	2.77	0.80	107	0.25	0.25	1.85	4.00	8.60
32	1991	SPRING	29	6.45	.25000	38.95	8.44	1.57	131	0.25	0.50	3.90	8.40	18.60
32	1991	SUMMER	36	6.69	.25000	45.00	11.50	1.92	172	0.25	0.31	2.05	6.15	40.00
32	1991	WINTER	11	4.14	.25000	20.90	6.34	1.91	153	0.25	0.25	2.00	4.90	20.90
32	1992	FALL	12	3.70	.25000	20.10	6.69	1.93	181	0.25	0.25	0.25	3.75	20.10
32	1992	SPRING	19	4.20	.25000	14.40	4.10	0.94	98	0.25	0.25	3.80	7.10	14.40

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Chloro_A_Phyto_Spec_A_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
32	1992	SUMMER	34	8.38	.25000	43.00	10.40	1.78	124	0.25	0.25	4.54	11.70	28.85
32	1992	WINTER	10	3.31	.25000	9.85	3.02	0.95	91	0.25	1.38	2.48	5.30	9.85
32	1993	FALL	21	5.89	.25000	42.20	11.24	2.45	191	0.25	0.25	0.25	5.01	32.20
32	1993	SPRING	23	2.75	.25000	12.10	3.66	0.76	133	0.25	0.25	0.50	5.61	10.90
32	1993	SUMMER	25	6.29	.25000	63.90	13.52	2.70	215	0.25	0.25	1.31	6.36	24.15
32	1993	WINTER	14	3.18	.25000	13.10	3.61	0.97	114	0.25	0.25	2.16	3.48	13.10
32	1994	FALL	23	1.58	.25000	7.78	2.61	0.54	165	0.25	0.25	0.25	1.91	7.21
32	1994	SPRING	26	4.09	.25000	29.20	7.37	1.44	180	0.25	0.25	0.25	3.27	20.30
32	1994	SUMMER	25	3.54	.25000	19.20	4.95	0.99	140	0.25	0.25	0.25	5.72	15.20
32	1994	WINTER	14	1.40	.25000	7.44	2.03	0.54	145	0.25	0.25	0.25	1.50	7.44
32	1995	FALL	22	3.35	.25000	11.60	3.27	0.70	98	0.25	0.25	2.79	5.90	7.90
32	1995	SPRING	23	2.04	.25000	15.60	4.04	0.84	198	0.25	0.25	0.25	2.40	13.20
32	1995	SUMMER	26	2.71	.25000	21.10	5.19	1.02	192	0.25	0.25	0.25	2.39	13.10
32	1995	WINTER	23	2.23	.25000	11.20	3.10	0.65	139	0.25	0.25	0.25	3.56	8.89
32	1996	FALL	4	18.61	.25000	73.70	36.73	18.36	197	0.25	0.25	0.25	36.98	73.70
32	1996	SPRING	21	3.62	.25000	11.40	4.44	0.97	123	0.25	0.25	1.15	8.50	11.20
32	1996	SUMMER	21	16.25	.25000	128.00	28.96	6.32	178	0.25	1.78	6.66	22.10	52.60
32	1996	WINTER	21	3.27	.25000	14.90	4.83	1.05	148	0.25	0.25	0.72	3.72	14.00

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1990	FALL	4	540.00	15.000	2100.00	1040.0	520.00	193	15.00	17.50	22.50	1062.5	2100.0
25	1990	SPRING	4	493.75	25.000	1450.00	670.76	335.38	136	25.00	27.50	250.00	960.00	1450.0
25	1990	SUMMER	4	500.63	7.5000	1950.00	966.28	483.14	193	7.50	13.75	22.50	987.50	1950.0
25	1990	WINTER	3	1385.83	7.5000	4100.00	2350.6	1357.1	170	7.50	7.50	50.00	4100.0	4100.0
25	1991	FALL	4	578.75	10.000	2200.00	1081.2	540.59	187	10.00	20.00	52.50	1137.5	2200.0
25	1991	SPRING	4	718.75	15.000	2750.00	1354.5	677.23	188	15.00	22.50	55.00	1415.0	2750.0
25	1991	SUMMER	4	304.38	7.5000	935.00	430.17	215.08	141	7.50	31.25	137.50	577.50	935.00
25	1991	WINTER	1	45.00	45.000	45.00	.	.	.	45.00	45.00	45.00	45.00	45.00
25	1992	FALL	3	813.33	20.000	2400.00	1374.1	793.33	169	20.00	20.00	20.00	2400.0	2400.0
25	1992	SPRING	4	333.13	17.500	1200.00	578.52	289.26	174	17.50	26.25	57.50	640.00	1200.0
25	1992	SUMMER	4	481.25	7.5000	1850.00	912.75	456.37	190	7.50	10.00	33.75	952.50	1850.0
25	1992	WINTER	3	1035.00	25.000	2750.00	1493.0	862.01	144	25.00	25.00	330.00	2750.0	2750.0
25	1993	FALL	9	424.78	15.000	1650.00	520.83	173.61	123	15.00	25.00	280.00	455.00	1650.0
25	1993	SPRING	10	513.75	5.0000	2100.00	636.61	201.31	124	5.00	190.00	237.50	850.00	2100.0
25	1993	SUMMER	10	303.00	10.000	1000.00	297.38	94.04	98	10.00	80.00	252.50	340.00	1000.0
25	1993	WINTER	9	600.56	5.0000	2100.00	665.76	221.92	111	5.00	160.00	325.00	825.00	2100.0
25	1994	FALL	9	439.44	5.0000	1650.00	536.46	178.82	122	5.00	30.00	255.00	515.00	1650.0
25	1994	SPRING	10	326.75	12.500	1150.00	364.94	115.40	112	12.50	40.00	210.00	600.00	1150.0
25	1994	SUMMER	10	296.25	5.0000	1300.00	387.33	122.49	131	5.00	25.00	195.00	325.00	1300.0
25	1994	WINTER	8	690.00	25.000	1850.00	631.64	223.32	92	25.00	187.50	535.00	1100.0	1850.0
25	1995	FALL	4	510.00	220.00	1000.00	349.40	174.70	69	220.00	262.50	410.00	757.50	1000.0
25	1995	SPRING	8	473.75	5.0000	1300.00	418.71	148.04	88	5.00	175.00	395.00	672.50	1300.0
25	1995	SUMMER	9	85.83	20.000	145.00	48.64	16.21	57	20.00	30.00	95.00	130.00	145.00
25	1995	WINTER	8	658.75	15.000	1850.00	652.85	230.82	99	15.00	122.50	492.50	1087.5	1850.0
25	1996	WINTER	1	1000.00	1000.0	1000.00	.	.	.	1000.0	1000.0	1000.0	1000.0	1000.0
25	1999	FALL	9	48.79	18.230	191.05	54.52	18.17	112	18.23	23.78	30.37	43.42	191.05
25	1999	SUMMER	10	37.60	5.8800	85.72	23.95	7.57	64	5.88	18.67	34.78	51.78	85.72
27	1990	FALL	13	96.15	5.0000	455.00	128.84	35.73	134	5.00	7.50	30.00	155.00	455.00
27	1990	SPRING	13	71.15	5.0000	255.00	74.15	20.56	104	5.00	17.50	40.00	110.00	255.00
27	1990	SUMMER	13	55.58	5.0000	270.00	73.96	20.51	133	5.00	5.00	27.50	75.00	270.00
27	1990	WINTER	12	66.88	5.0000	175.00	62.57	18.06	94	5.00	6.25	40.00	120.00	175.00
27	1991	FALL	13	95.77	5.0000	520.00	140.07	38.85	146	5.00	20.00	45.00	90.00	520.00

Aggregate Nutrient Ecoregion: V
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DIP_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
27	1991	SPRING	11	85.45	5.0000	380.00	109.94	33.15	129	5.00	7.50	45.00	140.00	380.00
27	1991	SUMMER	13	124.42	5.0000	585.00	168.45	46.72	135	5.00	7.50	25.00	210.00	585.00
27	1991	WINTER	13	87.88	5.0000	330.00	103.27	28.64	118	5.00	5.00	45.00	125.00	330.00
27	1992	FALL	12	66.04	5.0000	185.00	66.28	19.13	100	5.00	8.75	45.00	110.00	185.00
27	1992	SPRING	11	151.36	5.0000	815.00	231.82	69.90	153	5.00	7.50	90.00	190.00	815.00
27	1992	SUMMER	14	67.32	5.0000	205.00	66.61	17.80	99	5.00	5.00	55.00	100.00	205.00
27	1992	WINTER	13	71.92	5.0000	175.00	66.88	18.55	93	5.00	5.00	70.00	110.00	175.00
27	1993	FALL	16	120.94	5.0000	580.00	143.88	35.97	119	5.00	22.50	67.50	180.00	580.00
27	1993	SPRING	16	189.69	5.0000	1500.00	359.43	89.86	189	5.00	23.75	92.50	190.00	1500.0
27	1993	SUMMER	18	166.00	5.0000	1200.00	274.91	64.80	166	5.00	10.00	105.00	230.00	1200.0
27	1993	WINTER	15	157.33	5.0000	985.00	252.85	65.29	161	5.00	7.50	95.00	150.00	985.00
27	1994	FALL	9	233.06	5.0000	1100.00	352.18	117.39	151	5.00	25.00	65.00	230.00	1100.0
27	1994	SPRING	14	118.04	5.0000	875.00	224.82	60.09	190	5.00	17.50	42.50	130.00	875.00
27	1994	SUMMER	14	120.00	5.0000	1000.00	258.97	69.21	216	5.00	12.50	23.75	110.00	1000.0
27	1994	WINTER	12	113.33	5.0000	440.00	120.18	34.69	106	5.00	18.75	102.50	150.00	440.00
27	1995	FALL	1	30.00	30.000	30.00	.	.	.	30.00	30.00	30.00	30.00	30.00
27	1995	SPRING	6	93.75	5.0000	315.00	118.64	48.43	127	5.00	12.50	45.00	140.00	315.00
27	1995	SUMMER	7	55.79	5.0000	190.00	63.41	23.97	114	5.00	5.00	40.00	60.50	190.00
27	1995	WINTER	5	64.00	7.5000	170.00	65.45	29.27	102	7.50	12.50	60.00	70.00	170.00
27	1999	FALL	8	161.25	5.7300	395.64	171.79	60.74	107	5.73	34.51	60.39	349.44	395.64
27	1999	SUMMER	6	45.89	8.3600	127.89	42.20	17.23	92	8.36	20.69	37.94	42.53	127.89
32	1990	SPRING	3	21.67	5.0000	30.00	14.43	8.33	67	5.00	5.00	30.00	30.00	30.00
32	1990	SUMMER	3	39.17	7.5000	80.00	37.11	21.42	95	7.50	7.50	30.00	80.00	80.00
32	1990	WINTER	3	143.33	20.000	300.00	142.95	82.53	100	20.00	20.00	110.00	300.00	300.00
32	1991	FALL	3	76.67	30.000	120.00	45.09	26.03	59	30.00	30.00	80.00	120.00	120.00
32	1991	SPRING	3	54.17	7.5000	100.00	46.26	26.71	85	7.50	7.50	55.00	100.00	100.00
32	1991	SUMMER	3	81.67	7.5000	230.00	128.46	74.17	157	7.50	7.50	7.50	230.00	230.00
32	1991	WINTER	3	113.33	25.000	175.00	78.48	45.31	69	25.00	25.00	140.00	175.00	175.00
32	1992	SPRING	3	47.50	12.500	85.00	36.31	20.97	76	12.50	12.50	45.00	85.00	85.00
32	1992	SUMMER	3	15.00	5.0000	35.00	17.32	10.00	115	5.00	5.00	5.00	35.00	35.00
32	1992	WINTER	3	120.00	15.000	210.00	98.36	56.79	82	15.00	15.00	135.00	210.00	210.00
32	1993	FALL	3	236.67	25.000	640.00	349.44	201.75	148	25.00	25.00	45.00	640.00	640.00

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
DIP_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
32	1993	SPRING	6	161.67	5.0000	905.00	364.20	148.68	225	5.00	10.00	15.00	20.00	905.00
32	1993	SUMMER	6	165.00	5.0000	925.00	372.67	152.14	226	5.00	5.00	5.00	45.00	925.00
32	1993	WINTER	6	158.75	5.0000	860.00	343.92	140.41	217	5.00	5.00	18.75	45.00	860.00
32	1994	FALL	3	66.67	10.000	155.00	77.51	44.75	116	10.00	10.00	35.00	155.00	155.00
32	1994	SPRING	4	215.63	5.0000	760.00	365.06	182.53	169	5.00	6.25	48.75	425.00	760.00
32	1994	SUMMER	4	342.50	20.000	1300.00	638.34	319.17	186	20.00	22.50	25.00	662.50	1300.0
32	1994	WINTER	4	138.75	20.000	470.00	221.00	110.50	159	20.00	22.50	32.50	255.00	470.00
32	1995	FALL	2	510.00	5.0000	1015.00	714.18	505.00	140	5.00	5.00	510.00	1015.0	1015.0
32	1995	SPRING	3	80.00	10.000	210.00	112.69	65.06	141	10.00	10.00	20.00	210.00	210.00
32	1995	SUMMER	3	404.17	5.0000	1200.00	689.21	397.92	171	5.00	5.00	7.50	1200.0	1200.0
32	1995	WINTER	3	242.50	5.0000	700.00	396.30	228.81	163	5.00	5.00	22.50	700.00	700.00
32	1996	SPRING	2	387.50	5.0000	770.00	540.94	382.50	140	5.00	5.00	387.50	770.00	770.00
32	1996	SUMMER	2	431.25	7.5000	855.00	599.27	423.75	139	7.50	7.50	431.25	855.00	855.00
32	1996	WINTER	2	902.50	5.0000	1800.00	1269.3	897.50	141	5.00	5.00	902.50	1800.0	1800.0
42	1990	FALL	4	16.25	5.0000	50.00	22.50	11.25	138	5.00	5.00	5.00	27.50	50.00
42	1990	SPRING	6	44.08	5.0000	132.00	49.94	20.39	113	5.00	5.00	26.25	70.00	132.00
42	1990	SUMMER	6	110.92	5.0000	618.00	248.45	101.43	224	5.00	5.00	11.25	15.00	618.00
42	1990	WINTER	4	11.88	5.0000	30.00	12.14	6.07	102	5.00	5.00	6.25	18.75	30.00
42	1991	FALL	6	19.58	5.0000	70.00	25.90	10.58	132	5.00	5.00	6.25	25.00	70.00
42	1991	SPRING	5	21.50	5.0000	60.00	21.98	9.83	102	5.00	12.50	12.50	17.50	60.00
42	1991	SUMMER	5	15.00	5.0000	25.00	8.48	3.79	57	5.00	7.50	17.50	20.00	25.00
42	1991	WINTER	3	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
42	1992	FALL	4	26.25	5.0000	70.00	29.62	14.81	113	5.00	8.75	15.00	43.75	70.00
42	1992	SPRING	4	12.50	5.0000	35.00	15.00	7.50	120	5.00	5.00	5.00	20.00	35.00
42	1992	SUMMER	5	10.50	5.0000	20.00	6.71	3.00	64	5.00	5.00	7.50	15.00	20.00
42	1992	WINTER	4	29.38	5.0000	80.00	34.30	17.15	117	5.00	8.75	16.25	50.00	80.00
42	1993	FALL	5	20.00	5.0000	80.00	33.54	15.00	168	5.00	5.00	5.00	5.00	80.00
42	1993	SPRING	5	28.50	5.0000	90.00	34.76	15.54	122	5.00	12.50	17.50	17.50	90.00
42	1993	SUMMER	5	15.50	7.5000	35.00	11.24	5.02	72	7.50	10.00	10.00	15.00	35.00
42	1993	WINTER	3	24.17	5.0000	47.50	21.55	12.44	89	5.00	5.00	20.00	47.50	47.50
42	1994	FALL	3	8.33	5.0000	12.50	3.82	2.20	46	5.00	5.00	7.50	12.50	12.50
42	1994	SPRING	5	39.50	7.5000	60.00	22.46	10.04	57	7.50	27.50	42.50	60.00	60.00

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	1994	SUMMER	5	11.00	5.0000	25.00	8.94	4.00	81	5.00	5.00	5.00	15.00	25.00
42	1995	SPRING	2	168.75	40.000	297.50	182.08	128.75	108	40.00	40.00	168.75	297.50	297.50
42	1995	SUMMER	1	12.50	12.500	12.50	.	.	.	12.50	12.50	12.50	12.50	12.50
42	1999	FALL	5	244.85	26.800	992.50	418.82	187.30	171	26.80	36.05	78.74	90.16	992.50
42	1999	SUMMER	5	363.72	10.800	1660.00	725.53	324.47	199	10.80	15.88	31.66	100.28	1660.0
42	1999	WINTER	4	75.50	11.000	208.00	90.90	45.45	120	11.00	16.50	41.50	134.50	208.00
42	2000	SPRING	1	553.00	553.00	553.00	.	.	.	553.00	553.00	553.00	553.00	553.00

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1998 to 1998
Dissolved_Oxygen_percent_sat

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	1998	SUMMER	1	138.03	138.03	138.03	.	.	.	138.03	138.03	138.03	138.03	138.03

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Dissolved_Oxygen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1990	FALL	32	9.37	3.3000	13.10	1.78	0.32	19	7.00	8.45	9.35	10.50	12.10
25	1990	SPRING	36	9.20	3.8000	12.20	1.42	0.24	15	6.80	8.50	9.23	10.10	11.00
25	1990	SUMMER	40	7.95	.70000	12.40	2.20	0.35	28	2.58	7.38	8.10	9.35	10.40
25	1990	WINTER	30	10.84	8.2000	13.60	1.23	0.22	11	9.15	10.15	10.63	11.40	13.30
25	1991	FALL	31	9.76	5.0500	12.75	1.52	0.27	16	7.85	8.80	9.85	10.65	12.30
25	1991	SPRING	31	10.24	8.2000	13.20	1.24	0.22	12	8.60	9.40	10.10	11.00	12.50
25	1991	SUMMER	31	7.55	4.3000	10.70	1.19	0.21	16	6.10	7.10	7.50	7.85	10.10
25	1991	WINTER	26	11.19	8.2500	13.25	1.04	0.20	9	9.60	10.70	11.30	11.65	13.00
25	1992	FALL	24	9.51	5.3500	12.40	1.51	0.31	16	6.80	8.98	9.70	10.25	12.10
25	1992	SPRING	27	9.70	6.1000	12.35	1.32	0.25	14	7.90	8.90	9.60	10.50	12.00
25	1992	SUMMER	28	7.68	3.0000	10.20	1.54	0.29	20	3.80	7.25	7.98	8.35	9.40
25	1992	WINTER	28	11.47	9.1000	14.40	1.18	0.22	10	9.80	10.58	11.55	12.00	14.20
25	1993	FALL	32	10.09	4.4000	13.90	1.81	0.32	18	7.30	9.05	10.13	11.38	13.20
25	1993	SPRING	37	9.28	7.0000	11.50	1.17	0.19	13	7.60	8.20	9.10	10.10	11.45
25	1993	SUMMER	35	7.87	5.9500	10.60	0.84	0.14	11	6.40	7.40	7.80	8.30	10.00
25	1993	WINTER	28	11.90	8.8000	13.90	1.28	0.24	11	9.70	11.35	12.15	12.90	13.35
25	1994	FALL	31	8.74	4.3000	13.00	1.67	0.30	19	6.00	7.80	8.40	9.95	11.05
25	1994	SPRING	53	9.67	.70000	13.40	1.94	0.27	20	7.50	8.80	9.50	10.55	12.60
25	1994	SUMMER	37	7.65	1.3500	11.80	1.79	0.29	23	3.20	7.30	7.80	8.20	10.90
25	1994	WINTER	26	10.99	4.4000	13.50	1.97	0.39	18	6.40	10.10	11.53	11.95	13.50
25	1995	FALL	23	8.65	5.3000	12.70	1.49	0.31	17	6.60	8.00	8.50	9.60	10.60
25	1995	SPRING	26	9.56	6.1000	11.70	1.27	0.25	13	6.40	9.10	9.70	10.30	11.35
25	1995	SUMMER	28	7.53	2.8000	9.70	1.11	0.21	15	6.10	7.40	7.65	8.00	8.30
25	1995	WINTER	36	10.62	5.6000	13.70	1.91	0.32	18	7.10	9.95	10.98	11.90	13.00
25	1996	FALL	21	9.27	3.4000	12.60	2.02	0.44	22	6.95	8.40	9.75	10.90	11.10
25	1996	SPRING	17	9.40	6.7000	11.90	1.14	0.28	12	6.70	9.00	9.50	9.95	11.90
25	1996	SUMMER	19	7.19	4.4500	8.50	1.15	0.26	16	4.45	6.80	7.35	8.20	8.50
25	1996	WINTER	18	11.31	8.5000	13.20	1.26	0.30	11	8.50	10.60	11.28	12.40	13.20
25	1997	FALL	16	10.06	7.8000	13.30	1.27	0.32	13	7.80	9.33	9.90	10.50	13.30
25	1997	SPRING	16	10.17	1.4000	12.80	2.71	0.68	27	1.40	9.38	10.15	12.15	12.80
25	1997	SUMMER	14	8.70	6.4000	12.50	1.55	0.41	18	6.40	7.80	8.63	9.10	12.50
25	1997	WINTER	17	11.74	9.7000	14.30	1.39	0.34	12	9.70	10.90	11.10	12.80	14.30

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Dissolved_Oxygen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1998	WINTER	8	9.15	5.2000	12.80	2.23	0.79	24	5.20	8.20	9.00	10.40	12.80
25	1999	FALL	4	9.53	9.2000	9.86	0.38	0.19	4	9.20	9.20	9.53	9.86	9.86
25	1999	SUMMER	20	8.45	6.8000	10.70	1.19	0.27	14	6.80	7.66	8.39	8.74	10.70
25	2000	SPRING	10	8.52	4.3300	11.20	1.93	0.61	23	4.33	8.00	9.02	9.26	11.20
25	2000	SUMMER	10	8.79	6.4000	12.40	1.82	0.58	21	6.40	7.70	8.95	9.40	12.40
27	1990	FALL	85	9.07	1.9500	14.30	2.32	0.25	26	5.50	7.65	9.20	10.65	12.10
27	1990	SPRING	99	8.89	3.6000	13.40	1.82	0.18	20	5.70	7.70	9.10	10.15	11.90
27	1990	SUMMER	115	7.19	1.3000	13.90	2.18	0.20	30	4.30	5.65	7.00	8.25	11.45
27	1990	WINTER	62	11.40	8.1000	14.60	1.57	0.20	14	8.90	10.40	11.30	12.45	13.80
27	1991	FALL	89	8.79	.02500	14.30	2.61	0.28	30	2.70	8.20	9.40	10.30	11.60
27	1991	SPRING	98	8.61	.80000	14.20	2.16	0.22	25	4.30	7.40	8.78	9.90	11.85
27	1991	SUMMER	126	7.80	.70000	14.00	2.50	0.22	32	3.80	6.50	7.85	9.00	12.20
27	1991	WINTER	117	11.74	7.7000	14.70	1.34	0.12	11	9.15	11.00	11.95	12.50	13.80
27	1992	FALL	98	9.19	4.7000	13.25	1.75	0.18	19	5.80	8.30	9.10	10.30	12.05
27	1992	SPRING	104	9.26	3.6000	14.60	2.02	0.20	22	5.80	8.10	9.30	10.40	12.55
27	1992	SUMMER	132	6.96	.40000	13.90	2.13	0.19	31	3.55	5.73	7.15	8.28	10.40
27	1992	WINTER	102	11.66	6.9000	14.60	1.54	0.15	13	8.80	11.00	11.75	12.60	14.00
27	1993	FALL	90	9.21	2.3000	13.80	1.88	0.20	20	5.90	8.30	9.13	10.30	12.60
27	1993	SPRING	103	9.26	5.2500	12.20	1.28	0.13	14	7.30	8.75	9.20	10.00	11.40
27	1993	SUMMER	115	7.03	1.3000	10.55	1.38	0.13	20	4.60	6.40	7.05	7.70	9.45
27	1993	WINTER	99	11.07	5.3000	14.40	2.15	0.22	19	5.60	10.40	11.50	12.40	14.00
27	1994	FALL	99	8.40	.02500	13.70	2.46	0.25	29	4.00	6.90	8.85	10.00	11.55
27	1994	SPRING	95	9.02	3.3000	14.50	1.85	0.19	21	5.00	8.20	9.25	10.10	11.55
27	1994	SUMMER	119	7.20	1.2500	12.90	1.96	0.18	27	3.45	5.90	7.20	8.40	10.20
27	1994	WINTER	70	12.20	7.6000	14.40	1.48	0.18	12	9.00	11.90	12.70	13.00	13.80
27	1995	FALL	96	8.91	.80000	14.60	2.38	0.24	27	3.80	7.80	9.23	10.38	12.10
27	1995	SPRING	96	9.24	6.0000	13.30	1.51	0.15	16	6.75	8.30	9.10	9.90	12.90
27	1995	SUMMER	94	7.15	1.0000	11.90	1.41	0.15	20	5.00	6.45	7.03	8.05	9.40
27	1995	WINTER	78	11.55	5.0000	14.30	1.88	0.21	16	7.65	10.80	11.80	13.00	13.80
27	1996	FALL	88	9.32	2.6000	13.70	1.75	0.19	19	6.70	8.28	9.63	10.50	11.85
27	1996	SPRING	82	9.06	3.0000	14.00	2.24	0.25	25	5.60	7.40	9.25	10.70	12.20
27	1996	SUMMER	94	6.85	1.0000	13.90	2.07	0.21	30	2.60	5.80	6.83	7.80	10.60

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Dissolved_Oxygen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
27	1996	WINTER	46	11.86	7.4000	14.50	1.57	0.23	13	9.30	10.90	12.30	13.00	14.10
27	1997	FALL	68	8.85	.60000	13.85	2.52	0.31	28	4.20	7.33	9.30	10.75	12.20
27	1997	SPRING	74	10.56	3.5000	14.70	1.73	0.20	16	8.20	9.60	10.50	11.50	13.40
27	1997	SUMMER	71	7.38	3.8000	12.00	1.74	0.21	24	4.55	6.30	7.25	8.30	10.60
27	1997	WINTER	76	12.11	8.3500	14.10	1.15	0.13	10	9.60	11.58	12.23	13.00	13.80
27	1999	FALL	10	9.09	5.3300	10.63	2.10	0.66	23	5.33	8.80	10.18	10.52	10.63
27	1999	SUMMER	14	9.53	7.6000	14.31	2.29	0.61	24	7.60	7.74	8.93	10.20	14.31
27	2000	SPRING	8	7.20	1.8400	9.00	2.68	0.95	37	1.84	6.01	8.53	8.84	9.00
27	2000	SUMMER	8	6.97	4.3000	9.50	1.57	0.56	23	4.30	6.20	6.73	8.05	9.50
32	1990	FALL	26	6.76	3.1000	9.20	1.42	0.28	21	4.20	6.05	6.80	7.70	9.10
32	1990	SPRING	35	8.24	3.4000	11.00	1.54	0.26	19	5.40	7.40	8.25	9.30	10.80
32	1990	SUMMER	47	7.36	2.1000	11.65	2.07	0.30	28	4.50	6.00	7.00	8.90	10.80
32	1990	WINTER	30	9.32	5.2000	12.80	1.80	0.33	19	5.20	8.30	9.43	10.35	12.30
32	1991	FALL	29	8.17	5.6000	10.20	1.29	0.24	16	5.90	7.30	8.40	9.10	10.00
32	1991	SPRING	46	8.49	6.1000	11.00	1.25	0.18	15	6.80	7.50	8.35	9.50	10.45
32	1991	SUMMER	50	7.19	4.4000	9.20	1.19	0.17	17	5.20	6.40	7.23	8.00	9.00
32	1991	WINTER	31	9.86	7.3000	12.70	1.21	0.22	12	7.80	9.10	9.60	10.50	12.30
32	1992	FALL	28	7.14	3.1000	9.40	1.57	0.30	22	3.10	6.60	7.45	7.95	9.20
32	1992	SPRING	38	8.36	5.7000	11.65	1.01	0.16	12	6.50	7.75	8.45	8.80	9.90
32	1992	SUMMER	49	7.33	4.4000	10.05	1.28	0.18	17	5.00	6.60	7.20	8.15	9.40
32	1992	WINTER	37	10.14	7.7000	13.00	1.24	0.20	12	8.10	9.15	10.20	11.10	12.30
32	1993	FALL	28	8.25	3.7000	10.60	1.64	0.31	20	5.80	7.25	8.40	9.40	10.50
32	1993	SPRING	33	8.75	6.1000	12.80	1.49	0.26	17	7.00	7.90	8.55	9.20	12.70
32	1993	SUMMER	34	7.33	5.6000	9.70	1.10	0.19	15	5.90	6.40	7.30	8.20	9.30
32	1993	WINTER	27	10.45	8.8500	13.10	1.05	0.20	10	9.00	9.70	10.20	10.80	12.50
32	1994	FALL	31	8.15	4.6000	10.90	1.38	0.25	17	5.10	7.30	8.30	9.00	10.60
32	1994	SPRING	43	7.92	4.1000	11.80	1.43	0.22	18	5.90	7.40	7.90	8.50	10.30
32	1994	SUMMER	34	6.88	3.6000	12.70	1.88	0.32	27	4.70	5.70	6.40	7.80	11.80
32	1994	WINTER	39	10.32	6.6000	14.70	1.57	0.25	15	7.90	9.30	10.30	11.00	13.50
32	1995	FALL	26	7.44	3.5000	9.80	1.71	0.34	23	4.00	7.00	7.90	8.60	9.10
32	1995	SPRING	37	8.78	6.9000	11.70	1.06	0.17	12	7.00	8.25	8.90	9.30	10.70
32	1995	SUMMER	37	6.87	3.5000	11.05	1.74	0.29	25	4.10	6.00	6.70	7.90	10.90

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
32	1995	WINTER	35	9.94	7.3000	13.70	1.37	0.23	14	7.30	9.00	10.05	10.80	12.10
32	1996	FALL	6	5.12	1.4000	7.90	2.48	1.01	48	1.40	3.80	5.00	7.60	7.90
32	1996	SPRING	22	7.55	4.1000	11.10	1.80	0.38	24	4.20	6.00	7.85	8.60	10.10
32	1996	SUMMER	25	6.79	3.5000	12.00	2.07	0.41	30	3.70	5.40	6.20	8.20	9.50
32	1996	WINTER	21	10.03	4.7000	13.70	2.00	0.44	20	6.80	9.20	9.80	11.40	12.50
32	1997	SPRING	4	8.00	7.4000	8.40	0.45	0.23	6	7.40	7.65	8.10	8.35	8.40
32	1997	WINTER	9	9.73	8.5500	11.10	0.96	0.32	10	8.55	8.95	9.75	10.40	11.10
42	1990	FALL	6	10.20	6.1000	11.80	2.13	0.87	21	6.10	9.75	11.05	11.45	11.80
42	1990	SPRING	11	10.93	6.8000	14.20	2.17	0.65	20	6.80	10.30	11.10	12.80	14.20
42	1990	SUMMER	20	8.34	3.8750	14.00	1.79	0.40	21	5.39	7.80	8.30	8.90	11.65
42	1990	WINTER	7	10.89	7.6000	12.50	1.65	0.63	15	7.60	10.30	11.40	12.00	12.50
42	1991	FALL	7	10.36	9.2500	11.25	0.64	0.24	6	9.25	9.90	10.50	10.70	11.25
42	1991	SPRING	9	9.74	5.2000	12.50	2.22	0.74	23	5.20	8.60	9.90	11.10	12.50
42	1991	SUMMER	11	7.39	5.3000	8.90	1.06	0.32	14	5.30	6.65	7.50	8.40	8.90
42	1991	WINTER	5	11.04	9.4000	13.00	1.47	0.66	13	9.40	9.80	11.20	11.80	13.00
42	1992	FALL	6	11.15	10.000	12.65	0.98	0.40	9	10.00	10.55	10.85	12.00	12.65
42	1992	SPRING	8	11.13	9.5000	12.10	0.90	0.32	8	9.50	10.60	11.15	11.95	12.10
42	1992	SUMMER	7	9.02	8.0000	10.20	0.85	0.32	9	8.00	8.50	8.80	10.20	10.20
42	1992	WINTER	6	13.05	10.900	16.09	1.74	0.71	13	10.90	12.20	12.85	13.40	16.09
42	1993	FALL	9	10.98	9.2000	13.00	1.13	0.38	10	9.20	10.40	10.60	11.60	13.00
42	1993	SPRING	15	10.79	5.9500	14.40	2.13	0.55	20	5.95	10.05	10.80	12.00	14.40
42	1993	SUMMER	12	7.83	5.6000	9.65	1.38	0.40	18	5.60	6.85	7.90	9.15	9.65
42	1993	WINTER	7	11.22	8.6000	13.80	1.73	0.65	15	8.60	10.10	11.05	12.55	13.80
42	1994	FALL	4	11.11	9.2000	12.75	1.78	0.89	16	9.20	9.60	11.25	12.63	12.75
42	1994	SPRING	9	9.88	3.4000	11.65	2.53	0.84	26	3.40	9.90	10.60	11.00	11.65
42	1994	SUMMER	12	8.68	5.7000	11.10	1.70	0.49	20	5.70	7.70	8.15	10.50	11.10
42	1994	WINTER	2	10.50	9.4000	11.60	1.56	1.10	15	9.40	9.40	10.50	11.60	11.60
42	1995	FALL	3	12.33	10.600	14.20	1.80	1.04	15	10.60	10.60	12.20	14.20	14.20
42	1995	SPRING	7	10.79	8.4000	12.80	1.66	0.63	15	8.40	9.30	10.50	12.60	12.80
42	1995	SUMMER	4	7.08	3.4000	9.60	2.62	1.31	37	3.40	5.45	7.65	8.70	9.60
42	1995	WINTER	2	12.30	10.900	13.70	1.98	1.40	16	10.90	10.90	12.30	13.70	13.70
42	1996	FALL	3	11.57	10.100	13.00	1.45	0.84	13	10.10	10.10	11.60	13.00	13.00

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	1996	SPRING	5	9.94	8.3000	11.00	1.02	0.46	10	8.30	9.80	10.10	10.50	11.00
42	1996	SUMMER	6	7.93	4.7000	11.10	2.59	1.06	33	4.70	5.60	8.00	10.20	11.10
42	1996	WINTER	2	8.05	6.6000	9.50	2.05	1.45	25	6.60	6.60	8.05	9.50	9.50
42	1997	FALL	1	10.20	10.200	10.20	.	.	.	10.20	10.20	10.20	10.20	10.20
42	1997	SPRING	1	9.00	9.0000	9.00	.	.	.	9.00	9.00	9.00	9.00	9.00
42	1997	SUMMER	1	9.50	9.5000	9.50	.	.	.	9.50	9.50	9.50	9.50	9.50
42	1997	WINTER	2	6.70	.40000	13.00	8.91	6.30	133	0.40	0.40	6.70	13.00	13.00
42	1998	SPRING	1	11.20	11.200	11.20	.	.	.	11.20	11.20	11.20	11.20	11.20
42	1998	WINTER	1	10.50	10.500	10.50	.	.	.	10.50	10.50	10.50	10.50	10.50
42	1999	FALL	1	7.60	7.6000	7.60	.	.	.	7.60	7.60	7.60	7.60	7.60
42	1999	SUMMER	8	8.98	4.9000	10.79	1.87	0.66	21	4.90	8.48	9.37	10.22	10.79
42	2000	SPRING	4	9.07	7.0100	11.17	1.87	0.94	21	7.01	7.55	9.04	10.59	11.17
42	2000	SUMMER	3	9.80	7.2000	13.40	3.22	1.86	33	7.20	7.20	8.80	13.40	13.40

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Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1990	FALL	32	2.25	.00000	5.80	1.58	0.28	70	0.00	1.10	2.07	3.20	5.65
25	1990	SPRING	26	1.96	.10000	4.80	1.38	0.27	71	0.19	1.15	1.61	2.35	4.80
25	1990	SUMMER	30	1.31	.00000	4.95	1.33	0.24	101	0.00	0.37	1.04	1.55	4.40
25	1990	WINTER	26	2.72	.75000	6.65	1.60	0.31	59	0.77	1.45	2.13	3.80	6.35
25	1991	FALL	31	2.37	.00000	5.90	1.71	0.31	72	0.08	1.12	2.40	3.40	5.60
25	1991	SPRING	31	2.25	.00000	6.15	1.75	0.31	78	0.01	0.50	2.07	3.50	5.90
25	1991	SUMMER	29	1.18	.00000	4.40	1.04	0.19	88	0.00	0.35	1.14	1.65	3.10
25	1991	WINTER	25	2.86	.58500	6.45	1.82	0.36	64	0.88	1.40	2.16	4.70	6.40
25	1992	FALL	23	2.77	.00000	6.30	2.06	0.43	74	0.06	0.95	2.35	5.10	5.60
25	1992	SPRING	29	2.11	.00000	6.10	1.55	0.29	74	0.00	1.05	2.00	2.80	5.00
25	1992	SUMMER	30	1.46	.00000	5.00	1.29	0.24	89	0.00	0.45	1.12	2.50	4.10
25	1992	WINTER	29	3.05	.00000	7.10	2.07	0.39	68	0.22	1.58	2.40	4.80	6.80
25	1993	FALL	18	3.01	.00000	6.60	2.08	0.49	69	0.00	1.22	3.25	4.60	6.60
25	1993	SPRING	22	2.45	.30000	5.30	1.65	0.35	67	0.34	0.96	2.13	3.80	5.20
25	1993	SUMMER	19	2.00	.00000	5.10	1.59	0.37	80	0.00	0.86	1.60	3.10	5.10
25	1993	WINTER	20	3.33	.00000	7.00	2.24	0.50	67	0.08	1.60	3.03	5.20	6.90
25	1994	FALL	20	3.13	.06000	6.75	2.11	0.47	67	0.31	1.30	3.23	4.90	6.43
25	1994	SPRING	22	2.51	.00000	6.00	1.77	0.38	71	0.24	0.90	2.58	3.90	5.90
25	1994	SUMMER	21	2.44	.00000	6.40	2.06	0.45	84	0.00	1.15	1.49	4.05	6.00
25	1994	WINTER	15	3.47	.00000	6.90	2.49	0.64	72	0.00	1.32	4.20	5.65	6.90
25	1995	FALL	11	2.89	.00000	6.10	2.25	0.68	78	0.00	0.10	3.90	4.60	6.10
25	1995	SPRING	13	3.16	.05000	6.50	1.92	0.53	61	0.05	2.15	3.30	4.10	6.50
25	1995	SUMMER	14	0.95	.00000	2.80	0.79	0.21	83	0.00	0.60	0.79	1.21	2.80
25	1995	WINTER	12	4.23	.00250	9.40	2.78	0.80	66	0.00	2.88	4.25	5.83	9.40
25	1996	FALL	9	3.58	1.1000	5.50	1.42	0.47	40	1.10	2.75	3.75	4.50	5.50
25	1996	SPRING	11	4.22	.02000	8.76	2.83	0.85	67	0.02	1.80	4.30	7.00	8.76
25	1996	SUMMER	10	3.30	.08000	8.54	2.63	0.83	80	0.08	1.30	2.70	5.60	8.54
25	1996	WINTER	10	4.47	.02000	8.44	2.68	0.85	60	0.02	2.70	4.55	6.75	8.44
25	1997	FALL	9	3.03	.60000	5.20	1.48	0.49	49	0.60	1.90	3.00	4.10	5.20
25	1997	SPRING	8	3.67	.70000	7.00	2.18	0.77	59	0.70	2.33	3.00	5.50	7.00
25	1997	SUMMER	8	1.43	.00000	3.00	0.92	0.33	65	0.00	0.85	1.43	1.93	3.00
25	1997	WINTER	8	4.63	1.7000	7.10	1.77	0.63	38	1.70	3.50	4.60	6.00	7.10

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Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1998	WINTER	9	4.04	1.7000	6.85	1.84	0.61	45	1.70	3.10	3.70	4.90	6.85
25	1999	FALL	19	1.71	.01000	4.88	1.62	0.37	95	0.01	0.34	0.87	2.63	4.88
25	1999	SUMMER	20	1.34	.00000	3.78	1.38	0.31	103	0.00	0.34	0.81	2.86	3.78
25	2000	SPRING	10	1.85	.00000	5.66	2.06	0.65	111	0.00	0.28	0.83	2.85	5.66
27	1990	FALL	81	0.95	.00375	10.00	1.62	0.18	171	0.01	0.04	0.38	1.01	3.70
27	1990	SPRING	82	0.75	.00250	3.00	0.67	0.07	89	0.03	0.21	0.58	1.17	1.84
27	1990	SUMMER	102	0.63	.00500	7.00	1.02	0.10	162	0.01	0.13	0.20	0.80	2.54
27	1990	WINTER	54	1.15	.00500	6.60	1.18	0.16	102	0.03	0.50	0.82	1.50	2.90
27	1991	FALL	84	0.79	.00500	10.60	1.39	0.15	177	0.01	0.03	0.37	0.87	2.95
27	1991	SPRING	86	0.59	.00500	3.10	0.69	0.07	117	0.01	0.04	0.40	0.85	2.10
27	1991	SUMMER	118	0.58	.00500	7.10	0.99	0.09	170	0.01	0.08	0.16	0.71	2.40
27	1991	WINTER	118	1.09	.00500	6.98	1.27	0.12	117	0.01	0.13	0.71	1.41	3.89
27	1992	FALL	90	0.87	.00500	4.85	0.85	0.09	98	0.01	0.16	0.67	1.38	2.60
27	1992	SPRING	98	0.67	.00500	3.20	0.76	0.08	113	0.01	0.13	0.48	0.79	2.57
27	1992	SUMMER	123	0.65	.00500	4.65	0.69	0.06	105	0.01	0.13	0.50	1.00	1.71
27	1992	WINTER	109	1.22	.00500	5.10	1.18	0.11	97	0.02	0.24	0.88	1.89	3.62
27	1993	FALL	73	1.36	.03000	5.62	1.05	0.12	77	0.16	0.65	1.05	1.87	3.76
27	1993	SPRING	85	0.91	.02000	2.08	0.54	0.06	60	0.03	0.53	0.89	1.33	1.87
27	1993	SUMMER	79	0.95	.03000	3.07	0.65	0.07	69	0.09	0.47	0.84	1.21	2.43
27	1993	WINTER	93	1.30	.08300	3.15	0.71	0.07	55	0.14	0.78	1.30	1.90	2.51
27	1994	FALL	80	1.17	.00250	7.42	1.49	0.17	127	0.01	0.29	0.64	1.28	3.86
27	1994	SPRING	72	1.10	.02500	4.96	0.92	0.11	84	0.08	0.51	0.93	1.45	2.83
27	1994	SUMMER	99	1.05	.00000	7.54	1.30	0.13	124	0.00	0.23	0.70	1.26	3.48
27	1994	WINTER	61	2.04	.10000	8.95	1.56	0.20	76	0.34	0.99	1.71	2.68	4.76
27	1995	FALL	22	0.58	.01000	1.51	0.50	0.11	85	0.01	0.18	0.40	1.01	1.33
27	1995	SPRING	21	1.09	.01000	8.04	1.76	0.38	162	0.02	0.18	0.55	1.21	3.15
27	1995	SUMMER	23	1.19	.00250	10.50	2.59	0.54	218	0.00	0.03	0.35	0.78	7.39
27	1995	WINTER	16	1.11	.05000	7.30	1.87	0.47	167	0.05	0.21	0.41	1.16	7.30
27	1996	SPRING	15	0.85	.02000	3.09	1.09	0.28	128	0.02	0.06	0.26	1.56	3.09
27	1996	SUMMER	12	0.44	.00250	2.63	0.77	0.22	176	0.00	0.02	0.12	0.49	2.63
27	1996	WINTER	12	1.73	.01000	5.45	1.72	0.50	99	0.01	0.32	1.17	2.79	5.45
27	1997	FALL	5	0.16	.07000	0.41	0.14	0.06	93	0.07	0.07	0.11	0.12	0.41

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Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
27	1997	SPRING	5	0.32	.01000	1.31	0.55	0.25	172	0.01	0.03	0.13	0.13	1.31
27	1997	SUMMER	5	0.15	.04000	0.29	0.11	0.05	70	0.04	0.05	0.17	0.20	0.29
27	1999	FALL	16	1.37	.22000	2.75	0.99	0.25	72	0.22	0.51	1.02	2.47	2.75
27	1999	SUMMER	14	1.60	.41000	3.43	0.86	0.23	54	0.41	0.87	1.63	1.85	3.43
27	2000	SPRING	8	1.08	.15000	2.67	1.00	0.35	93	0.15	0.22	0.70	1.99	2.67
32	1990	FALL	22	2.38	.02000	10.00	3.00	0.64	126	0.03	0.30	0.83	5.20	8.20
32	1990	SPRING	25	1.26	.02500	8.80	1.77	0.35	141	0.10	0.40	0.70	1.35	3.80
32	1990	SUMMER	26	1.32	.02500	9.90	2.50	0.49	190	0.03	0.10	0.40	1.10	8.60
32	1990	WINTER	24	2.37	.02500	6.50	2.10	0.43	88	0.15	0.65	1.73	3.90	6.35
32	1991	FALL	20	1.93	.13000	9.70	2.75	0.61	143	0.16	0.57	0.94	1.78	9.45
32	1991	SPRING	28	1.77	.01000	8.10	2.21	0.42	125	0.24	0.53	0.75	1.72	6.35
32	1991	SUMMER	26	1.43	.01000	9.00	2.39	0.47	167	0.01	0.06	0.48	1.40	8.20
32	1991	WINTER	26	2.69	.02000	10.00	2.89	0.57	108	0.50	0.63	1.20	4.20	8.80
32	1992	FALL	17	2.30	.01000	9.80	3.05	0.74	132	0.01	0.09	1.30	3.20	9.80
32	1992	SPRING	27	1.43	.13000	5.80	1.27	0.25	89	0.23	0.54	1.10	2.00	3.46
32	1992	SUMMER	26	1.71	.01000	6.60	1.82	0.36	106	0.06	0.34	0.91	2.30	5.60
32	1992	WINTER	30	1.43	.20000	5.60	1.50	0.27	105	0.27	0.53	0.83	1.55	5.25
32	1993	SPRING	3	0.84	.47500	1.20	0.36	0.21	43	0.48	0.48	0.83	1.20	1.20
32	1993	SUMMER	3	0.85	.20000	2.00	1.00	0.58	118	0.20	0.20	0.34	2.00	2.00
32	1993	WINTER	3	0.91	.53000	1.50	0.52	0.30	56	0.53	0.53	0.71	1.50	1.50
32	1994	FALL	15	0.86	.13000	2.43	0.64	0.17	74	0.13	0.29	0.93	1.27	2.43
32	1994	SPRING	1	0.81	.81000	0.81	.	.	.	0.81	0.81	0.81	0.81	0.81
32	1994	SUMMER	1	0.07	.07300	0.07	.	.	.	0.07	0.07	0.07	0.07	0.07
32	1994	WINTER	5	1.79	.16000	4.79	1.88	0.84	105	0.16	0.69	0.86	2.44	4.79
32	1995	FALL	22	2.13	.00250	9.29	2.58	0.55	121	0.02	0.36	1.23	2.63	6.68
32	1995	SPRING	23	1.68	.17000	8.22	1.80	0.38	107	0.38	0.43	1.28	1.99	4.32
32	1995	SUMMER	26	1.05	.00250	5.02	1.03	0.20	99	0.00	0.28	0.89	1.41	2.35
32	1995	WINTER	22	1.54	.00250	9.28	2.21	0.47	143	0.04	0.34	0.86	1.66	5.53
32	1996	FALL	4	0.59	.00250	1.82	0.85	0.42	145	0.00	0.03	0.26	1.14	1.82
32	1996	WINTER	7	2.70	.13000	8.09	2.52	0.95	93	0.13	1.54	2.05	2.62	8.09
42	1990	FALL	6	0.35	.02500	1.05	0.44	0.18	126	0.03	0.04	0.12	0.75	1.05
42	1990	SPRING	6	0.25	.00900	0.86	0.32	0.13	132	0.01	0.03	0.12	0.35	0.86

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Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	1990	SUMMER	13	0.07	.00250	0.50	0.14	0.04	204	0.00	0.00	0.02	0.09	0.50
42	1990	WINTER	6	0.32	.02500	1.06	0.45	0.18	141	0.03	0.04	0.04	0.70	1.06
42	1991	FALL	7	0.25	.01000	0.90	0.37	0.14	151	0.01	0.02	0.02	0.67	0.90
42	1991	SPRING	9	0.19	.01000	0.70	0.26	0.09	137	0.01	0.02	0.02	0.40	0.70
42	1991	SUMMER	10	0.11	.00250	0.60	0.20	0.06	174	0.00	0.01	0.02	0.10	0.60
42	1991	WINTER	6	0.66	.01000	1.54	0.66	0.27	101	0.01	0.03	0.54	1.30	1.54
42	1992	FALL	8	1.41	.01000	4.61	2.02	0.71	143	0.01	0.02	0.50	2.81	4.61
42	1992	SPRING	10	0.27	.01000	0.79	0.30	0.10	113	0.01	0.03	0.17	0.63	0.79
42	1992	SUMMER	9	0.16	.01000	0.94	0.30	0.10	187	0.01	0.02	0.08	0.12	0.94
42	1992	WINTER	8	0.50	.01000	1.12	0.54	0.19	109	0.01	0.02	0.31	1.11	1.12
42	1993	FALL	4	0.52	.06900	1.40	0.62	0.31	119	0.07	0.08	0.31	0.96	1.40
42	1993	SPRING	6	0.29	.01000	0.81	0.32	0.13	109	0.01	0.02	0.20	0.52	0.81
42	1993	SUMMER	4	0.20	.02500	0.57	0.25	0.13	126	0.03	0.06	0.10	0.34	0.57
42	1993	WINTER	5	0.75	.08100	1.27	0.49	0.22	66	0.08	0.45	0.80	1.15	1.27
42	1994	FALL	4	0.32	.10000	0.43	0.15	0.08	48	0.10	0.21	0.37	0.42	0.43
42	1994	SPRING	6	0.43	.02500	1.10	0.39	0.16	89	0.03	0.19	0.33	0.64	1.10
42	1994	SUMMER	8	3.59	.02500	8.44	3.39	1.20	94	0.03	0.29	2.97	6.88	8.44
42	1994	WINTER	1	0.80	.80000	0.80	.	.	.	0.80	0.80	0.80	0.80	0.80
42	1995	FALL	1	0.50	.50000	0.50	.	.	.	0.50	0.50	0.50	0.50	0.50
42	1995	SPRING	4	0.34	.20000	0.48	0.12	0.06	36	0.20	0.25	0.35	0.44	0.48
42	1995	SUMMER	8	0.18	.01000	0.72	0.27	0.10	155	0.01	0.01	0.04	0.30	0.72
42	1995	WINTER	2	0.98	.60000	1.35	0.53	0.38	54	0.60	0.60	0.98	1.35	1.35
42	1996	FALL	1	0.40	.40000	0.40	.	.	.	0.40	0.40	0.40	0.40	0.40
42	1996	SPRING	3	0.17	.06000	0.25	0.10	0.06	58	0.06	0.06	0.20	0.25	0.25
42	1996	SUMMER	1	0.03	.02500	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
42	1996	WINTER	1	1.00	1.0000	1.00	.	.	.	1.00	1.00	1.00	1.00	1.00
42	1997	FALL	1	0.50	.50000	0.50	.	.	.	0.50	0.50	0.50	0.50	0.50
42	1997	SPRING	1	0.10	.10000	0.10	.	.	.	0.10	0.10	0.10	0.10	0.10
42	1997	SUMMER	1	0.10	.10000	0.10	.	.	.	0.10	0.10	0.10	0.10	0.10
42	1997	WINTER	1	0.90	.90000	0.90	.	.	.	0.90	0.90	0.90	0.90	0.90
42	1998	SPRING	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
42	1998	SUMMER	1	0.10	.10000	0.10	.	.	.	0.10	0.10	0.10	0.10	0.10

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	1998	WINTER	1	0.80	.80000	0.80	.	.	.	0.80	0.80	0.80	0.80	0.80
42	1999	FALL	8	1.05	.49000	2.00	0.66	0.23	63	0.49	0.55	0.66	1.75	2.00
42	1999	SUMMER	8	0.72	.00000	1.67	0.64	0.23	88	0.00	0.28	0.59	1.19	1.67
42	1999	WINTER	4	0.28	.10000	0.70	0.29	0.14	104	0.10	0.10	0.15	0.45	0.70
42	2000	SPRING	4	0.75	.10000	2.10	0.91	0.46	122	0.10	0.24	0.40	1.27	2.10

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Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1990	FALL	32	1.14	.00000	9.00	1.76	0.31	155	0.00	0.18	0.51	1.50	4.25
25	1990	SPRING	30	1.14	.00000	6.50	1.33	0.24	117	0.00	0.53	0.73	1.15	3.90
25	1990	SUMMER	35	1.09	.00000	8.40	1.54	0.26	141	0.00	0.40	0.70	1.20	4.40
25	1990	WINTER	28	2.46	.00000	28.00	5.21	0.99	212	0.00	0.30	0.87	3.23	4.20
25	1991	FALL	32	1.36	.00000	6.20	1.38	0.24	101	0.00	0.60	0.85	1.78	4.80
25	1991	SPRING	33	1.41	.00000	6.20	1.41	0.24	100	0.00	0.50	0.95	2.10	5.20
25	1991	SUMMER	32	0.96	.00000	2.50	0.75	0.13	78	0.00	0.45	0.78	1.45	2.15
25	1991	WINTER	24	1.43	.00000	5.15	1.44	0.29	101	0.00	0.30	0.85	2.60	4.15
25	1992	FALL	23	1.04	.00000	5.60	1.33	0.28	129	0.00	0.30	0.60	1.30	4.00
25	1992	SPRING	30	1.16	.00000	4.50	1.18	0.22	101	0.00	0.50	0.65	1.50	4.00
25	1992	SUMMER	31	1.02	.00000	3.80	1.02	0.18	100	0.00	0.50	0.73	1.30	3.80
25	1992	WINTER	24	1.63	.00000	8.90	2.01	0.41	124	0.00	0.48	0.95	1.90	5.25
25	1993	FALL	37	1.15	.00000	4.10	1.00	0.16	87	0.00	0.60	0.90	1.40	4.10
25	1993	SPRING	39	1.24	.00000	6.45	1.10	0.18	89	0.13	0.69	0.90	1.70	2.90
25	1993	SUMMER	38	1.00	.00000	3.60	0.95	0.15	95	0.00	0.40	0.70	1.07	3.30
25	1993	WINTER	32	1.34	.00000	6.75	1.56	0.28	116	0.13	0.40	0.69	1.70	5.20
25	1994	FALL	32	1.13	.00000	3.90	1.03	0.18	91	0.05	0.40	0.67	1.59	3.90
25	1994	SPRING	54	1.18	.00000	5.30	1.04	0.14	89	0.24	0.60	0.88	1.35	4.00
25	1994	SUMMER	45	1.17	.00000	4.30	0.91	0.14	77	0.29	0.60	1.00	1.35	3.50
25	1994	WINTER	29	1.41	.00000	5.50	1.41	0.26	100	0.30	0.50	0.80	2.00	5.20
25	1995	FALL	26	1.08	.05000	2.40	0.66	0.13	61	0.30	0.50	1.03	1.50	2.30
25	1995	SPRING	30	1.43	.20000	5.20	1.36	0.25	95	0.40	0.65	0.90	1.65	5.20
25	1995	SUMMER	35	0.89	.00000	5.20	0.87	0.15	98	0.00	0.40	0.80	1.10	1.85
25	1995	WINTER	32	1.67	.17000	6.20	1.51	0.27	90	0.20	0.50	0.90	2.45	5.40
25	1996	FALL	14	1.36	.00000	4.50	1.21	0.32	89	0.00	0.70	1.13	1.60	4.50
25	1996	SPRING	15	1.20	.02500	3.05	0.92	0.24	77	0.03	0.39	0.97	1.80	3.05
25	1996	SUMMER	17	1.12	.40000	2.10	0.50	0.12	45	0.40	0.80	1.10	1.30	2.10
25	1996	WINTER	18	1.57	.10000	5.20	1.44	0.34	92	0.10	0.68	1.07	2.25	5.20
25	1997	FALL	14	1.20	.00000	4.80	1.24	0.33	103	0.00	0.45	0.78	1.80	4.80
25	1997	SPRING	13	1.20	.00000	3.50	1.08	0.30	90	0.00	0.50	0.70	2.00	3.50
25	1997	SUMMER	13	0.70	.00000	1.10	0.28	0.08	40	0.00	0.65	0.75	0.80	1.10
25	1997	WINTER	13	1.61	.60000	3.70	0.82	0.23	51	0.60	1.10	1.50	2.00	3.70

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1998	WINTER	13	1.27	.40000	2.55	0.76	0.21	60	0.40	0.70	0.80	2.00	2.55
27	1990	FALL	33	0.77	.07500	2.30	0.49	0.09	63	0.13	0.48	0.71	0.90	1.80
27	1990	SPRING	32	1.09	.07500	5.40	1.00	0.18	92	0.45	0.60	0.86	1.10	3.72
27	1990	SUMMER	60	0.85	.11000	6.30	0.99	0.13	116	0.11	0.22	0.58	1.05	2.64
27	1990	WINTER	55	0.74	.12500	2.00	0.38	0.05	51	0.21	0.51	0.70	0.85	1.35
27	1991	FALL	40	0.80	.05000	4.30	0.89	0.14	112	0.06	0.42	0.59	0.81	3.10
27	1991	SPRING	32	1.15	.31250	4.80	0.80	0.14	69	0.51	0.74	0.95	1.38	2.40
27	1991	SUMMER	66	1.13	.05000	3.00	0.65	0.08	57	0.40	0.70	0.88	1.41	2.48
27	1991	WINTER	66	0.75	.05000	3.30	0.53	0.07	71	0.20	0.48	0.58	0.85	1.75
27	1992	FALL	37	0.80	.05000	5.37	0.92	0.15	115	0.05	0.40	0.60	0.90	2.80
27	1992	SPRING	47	0.75	.05000	2.80	0.54	0.08	72	0.08	0.45	0.67	0.90	1.50
27	1992	SUMMER	69	1.25	.07500	5.11	1.09	0.13	87	0.40	0.69	0.90	1.23	4.15
27	1992	WINTER	57	0.57	.02500	1.40	0.27	0.04	48	0.20	0.35	0.60	0.70	1.05
27	1993	FALL	33	0.61	.20000	1.51	0.30	0.05	49	0.28	0.40	0.60	0.70	1.20
27	1993	SPRING	37	1.14	.07500	4.65	0.92	0.15	80	0.15	0.60	0.80	1.37	2.92
27	1993	SUMMER	50	1.10	.15000	2.90	0.64	0.09	58	0.30	0.70	0.99	1.23	2.75
27	1993	WINTER	52	0.65	.11500	2.19	0.41	0.06	63	0.20	0.38	0.60	0.70	1.55
27	1994	FALL	35	0.90	.07500	6.90	1.10	0.19	121	0.10	0.46	0.85	1.00	1.33
27	1994	SPRING	47	0.89	.08000	2.15	0.44	0.06	49	0.23	0.60	0.80	1.10	1.90
27	1994	SUMMER	62	1.18	.20000	3.03	0.65	0.08	55	0.40	0.72	1.02	1.50	2.30
27	1994	WINTER	28	0.57	.07500	1.17	0.31	0.06	53	0.10	0.36	0.55	0.90	1.05
27	1995	FALL	28	0.65	.05000	1.74	0.41	0.08	63	0.15	0.36	0.50	0.85	1.52
27	1995	SPRING	25	0.74	.12000	1.93	0.45	0.09	60	0.27	0.39	0.62	1.00	1.47
27	1995	SUMMER	26	0.75	.19000	1.36	0.31	0.06	41	0.20	0.60	0.79	0.95	1.30
27	1995	WINTER	19	0.46	.05000	0.96	0.27	0.06	59	0.05	0.21	0.50	0.70	0.96
27	1996	FALL	15	0.59	.12500	1.55	0.37	0.09	62	0.13	0.40	0.50	0.70	1.55
27	1996	SPRING	18	0.91	.24000	3.26	0.69	0.16	76	0.24	0.38	0.82	1.12	3.26
27	1996	SUMMER	31	1.05	.16000	3.45	0.77	0.14	74	0.21	0.55	0.89	1.13	2.85
27	1996	WINTER	19	0.57	.05000	1.37	0.32	0.07	56	0.05	0.34	0.52	0.79	1.37
27	1997	FALL	5	1.05	.40000	2.20	0.68	0.30	65	0.40	0.80	0.90	0.95	2.20
27	1997	SPRING	9	0.95	.22500	1.65	0.53	0.18	56	0.23	0.40	1.10	1.40	1.65
27	1997	SUMMER	5	1.68	1.2000	2.20	0.37	0.17	22	1.20	1.50	1.70	1.80	2.20

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Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
27	1997	WINTER	4	0.38	.17500	0.80	0.28	0.14	74	0.18	0.23	0.28	0.54	0.80
32	1990	FALL	23	0.95	.30000	2.35	0.48	0.10	51	0.50	0.60	0.90	1.10	1.80
32	1990	SPRING	27	0.85	.20000	2.90	0.55	0.11	65	0.40	0.50	0.70	0.95	1.85
32	1990	SUMMER	27	0.62	.12500	1.50	0.35	0.07	56	0.20	0.40	0.60	0.80	1.35
32	1990	WINTER	25	0.96	.05000	2.70	0.64	0.13	66	0.20	0.50	0.90	1.35	2.20
32	1991	FALL	24	0.66	.05000	2.40	0.47	0.10	72	0.20	0.35	0.56	0.88	1.20
32	1991	SPRING	36	0.90	.05000	3.80	0.67	0.11	74	0.18	0.50	0.80	1.15	2.00
32	1991	SUMMER	35	0.89	.30000	2.80	0.51	0.09	57	0.30	0.60	0.80	1.00	2.00
32	1991	WINTER	29	0.98	.30000	5.40	1.03	0.19	105	0.30	0.45	0.70	1.00	3.20
32	1992	FALL	22	0.74	.05000	2.50	0.52	0.11	70	0.30	0.40	0.55	1.00	1.40
32	1992	SPRING	31	0.61	.16000	1.75	0.30	0.05	50	0.18	0.45	0.50	0.70	1.20
32	1992	SUMMER	30	0.71	.02500	2.20	0.56	0.10	79	0.05	0.30	0.63	0.90	2.00
32	1992	WINTER	34	0.54	.05000	1.20	0.30	0.05	55	0.05	0.40	0.50	0.60	1.20
32	1993	FALL	28	0.49	.12500	1.18	0.27	0.05	56	0.15	0.30	0.44	0.62	1.00
32	1993	SPRING	35	0.44	.05000	1.62	0.31	0.05	72	0.05	0.25	0.35	0.56	0.90
32	1993	SUMMER	33	0.57	.09000	1.45	0.33	0.06	58	0.13	0.33	0.50	0.80	1.20
32	1993	WINTER	29	0.45	.05000	1.61	0.33	0.06	73	0.05	0.30	0.42	0.60	0.85
32	1994	FALL	35	0.60	.12000	2.60	0.48	0.08	79	0.13	0.30	0.50	0.70	1.80
32	1994	SPRING	48	0.74	.19000	2.38	0.50	0.07	68	0.20	0.40	0.60	0.95	1.70
32	1994	SUMMER	34	0.66	.20000	1.90	0.37	0.06	56	0.22	0.47	0.57	0.86	1.27
32	1994	WINTER	39	0.60	.05000	3.78	0.62	0.10	102	0.05	0.30	0.40	0.77	1.40
32	1995	FALL	28	0.61	.13000	3.00	0.56	0.11	92	0.15	0.30	0.42	0.66	1.25
32	1995	SPRING	40	0.79	.16000	4.72	0.83	0.13	105	0.23	0.38	0.54	0.74	2.41
32	1995	SUMMER	39	0.59	.05000	2.76	0.47	0.08	80	0.18	0.30	0.46	0.65	1.46
32	1995	WINTER	37	0.44	.05000	1.30	0.31	0.05	70	0.12	0.22	0.40	0.58	1.17
32	1996	FALL	7	0.67	.05000	1.87	0.61	0.23	91	0.05	0.30	0.45	0.85	1.87
32	1996	SPRING	30	0.84	.05000	2.20	0.56	0.10	67	0.21	0.36	0.70	1.15	1.90
32	1996	SUMMER	28	0.78	.22000	2.11	0.49	0.09	62	0.27	0.40	0.70	0.93	2.10
32	1996	WINTER	27	0.65	.11000	1.89	0.48	0.09	75	0.13	0.23	0.55	0.82	1.60
32	1997	SPRING	6	1.10	.05000	3.60	1.32	0.54	120	0.05	0.30	0.58	1.50	3.60
32	1997	WINTER	6	0.18	.05000	0.45	0.19	0.08	111	0.05	0.05	0.05	0.40	0.45
42	1990	FALL	6	0.62	.20000	1.25	0.34	0.14	56	0.20	0.50	0.58	0.60	1.25

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	1990	SPRING	8	0.68	.07500	1.27	0.40	0.14	59	0.08	0.40	0.70	0.95	1.27
42	1990	SUMMER	19	1.33	.20000	4.00	1.03	0.24	78	0.20	0.70	1.00	1.55	4.00
42	1990	WINTER	6	0.55	.30000	0.90	0.20	0.08	36	0.30	0.45	0.53	0.57	0.90
42	1991	FALL	7	0.64	.15000	1.30	0.41	0.16	65	0.15	0.20	0.55	0.90	1.30
42	1991	SPRING	7	0.57	.30000	0.82	0.20	0.07	35	0.30	0.40	0.50	0.80	0.82
42	1991	SUMMER	11	0.94	.10000	1.90	0.46	0.14	49	0.10	0.70	1.00	1.10	1.90
42	1991	WINTER	5	0.58	.07500	0.85	0.30	0.13	51	0.08	0.60	0.69	0.70	0.85
42	1992	FALL	8	0.68	.30000	1.00	0.25	0.09	38	0.30	0.50	0.65	0.90	1.00
42	1992	SPRING	6	0.53	.15000	1.30	0.49	0.20	92	0.15	0.20	0.28	0.99	1.30
42	1992	SUMMER	7	0.79	.20000	1.15	0.37	0.14	46	0.20	0.40	0.90	1.11	1.15
42	1992	WINTER	5	0.51	.30000	0.73	0.17	0.07	33	0.30	0.40	0.50	0.60	0.73
42	1993	FALL	6	0.45	.07500	0.60	0.21	0.08	46	0.08	0.40	0.50	0.60	0.60
42	1993	SPRING	12	0.97	.20000	2.40	0.62	0.18	64	0.20	0.51	0.80	1.43	2.40
42	1993	SUMMER	9	0.93	.30000	1.70	0.54	0.18	58	0.30	0.60	0.75	1.30	1.70
42	1993	WINTER	5	1.00	.30000	2.18	0.72	0.32	72	0.30	0.70	0.70	1.10	2.18
42	1994	FALL	7	0.54	.20000	1.20	0.34	0.13	62	0.20	0.30	0.40	0.70	1.20
42	1994	SPRING	7	0.84	.20000	1.70	0.50	0.19	60	0.20	0.40	0.85	1.20	1.70
42	1994	SUMMER	13	0.82	.28000	2.17	0.58	0.16	71	0.28	0.30	0.70	1.20	2.17
42	1994	WINTER	1	0.80	.80000	0.80	.	.	.	0.80	0.80	0.80	0.80	0.80
42	1995	FALL	5	1.04	.30000	3.40	1.32	0.59	127	0.30	0.40	0.50	0.60	3.40
42	1995	SPRING	8	0.97	.10000	1.54	0.49	0.17	51	0.10	0.63	1.10	1.35	1.54
42	1995	SUMMER	12	1.53	.30000	4.50	1.27	0.37	83	0.30	0.93	1.08	1.40	4.50
42	1995	WINTER	2	1.00	.50000	1.50	0.71	0.50	71	0.50	0.50	1.00	1.50	1.50
42	1996	FALL	2	1.05	.50000	1.60	0.78	0.55	74	0.50	0.50	1.05	1.60	1.60
42	1996	SPRING	5	0.84	.40000	1.10	0.32	0.14	38	0.40	0.60	1.00	1.10	1.10
42	1996	SUMMER	6	1.64	.80000	2.85	0.71	0.29	43	0.80	1.15	1.58	1.90	2.85
42	1996	WINTER	1	1.50	1.5000	1.50	.	.	.	1.50	1.50	1.50	1.50	1.50
42	1997	SPRING	1	0.30	.30000	0.30	.	.	.	0.30	0.30	0.30	0.30	0.30
42	1997	SUMMER	1	0.60	.60000	0.60	.	.	.	0.60	0.60	0.60	0.60	0.60
42	1997	WINTER	1	4.05	4.0500	4.05	.	.	.	4.05	4.05	4.05	4.05	4.05
42	1999	FALL	1	1.97	1.9700	1.97	.	.	.	1.97	1.97	1.97	1.97	1.97
42	1999	SUMMER	1	2.84	2.8350	2.84	.	.	.	2.84	2.84	2.84	2.84	2.84

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	1999	WINTER	4	0.66	.34000	1.14	0.35	0.17	53	0.34	0.42	0.57	0.89	1.14
42	2000	SPRING	1	2.88	2.8800	2.88	.	.	.	2.88	2.88	2.88	2.88	2.88

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1999 to 2000
Organic_P_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1999	FALL	19	17.34	1.5100	87.01	19.64	4.51	113	1.51	6.24	12.39	20.97	87.01
25	1999	SUMMER	20	103.22	4.3300	348.11	105.37	23.56	102	4.33	29.29	65.20	156.62	348.11
25	2000	SPRING	10	38.64	1.8400	154.83	53.90	17.05	140	1.84	8.61	14.84	40.11	154.83
27	1999	FALL	16	51.05	13.710	99.08	24.91	6.23	49	13.71	37.88	44.97	64.96	99.08
27	1999	SUMMER	14	73.14	38.590	149.17	36.48	9.75	50	38.59	50.98	57.20	96.32	149.17
27	2000	SPRING	8	91.13	31.850	177.15	44.03	15.57	48	31.85	61.88	88.14	110.00	177.15
42	1999	FALL	7	31.50	4.1000	59.50	25.90	9.79	82	4.10	4.10	18.49	59.50	59.50
42	1999	SUMMER	7	105.99	46.810	177.75	46.89	17.72	44	46.81	46.81	106.54	128.74	177.75
42	2000	SPRING	3	101.14	76.890	130.27	27.02	15.60	27	76.89	76.89	96.26	130.27	130.27

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1992
Phosph_Ortho_Tot_as_P_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1990	FALL	4	526.25	5.0000	2000.00	982.76	491.38	187	5.00	22.50	50.00	1030.0	2000.0
25	1991	FALL	4	580.00	5.0000	2200.00	1080.5	540.26	186	5.00	17.50	57.50	1142.5	2200.0
25	1991	SPRING	4	735.00	20.000	2800.00	1377.0	688.51	187	20.00	25.00	60.00	1445.0	2800.0
25	1991	SUMMER	3	426.67	30.000	1000.00	508.56	293.62	119	30.00	30.00	250.00	1000.0	1000.0
25	1991	WINTER	1	40.00	40.000	40.00	.	.	.	40.00	40.00	40.00	40.00	40.00
25	1992	FALL	3	816.67	20.000	2400.00	1371.2	791.67	168	20.00	20.00	30.00	2400.0	2400.0
25	1992	SPRING	4	360.00	5.0000	1300.00	627.44	313.72	174	5.00	30.00	67.50	690.00	1300.0
25	1992	SUMMER	4	480.00	30.000	1800.00	880.04	440.02	183	30.00	35.00	45.00	925.00	1800.0
25	1992	WINTER	3	1100.00	50.000	2900.00	1566.0	904.16	142	50.00	50.00	350.00	2900.0	2900.0
27	1990	FALL	13	109.23	5.0000	430.00	123.57	34.27	113	5.00	20.00	30.00	190.00	430.00
27	1990	WINTER	2	160.00	120.00	200.00	56.57	40.00	35	120.00	120.00	160.00	200.00	200.00
27	1991	FALL	13	101.92	5.0000	450.00	126.43	35.07	124	5.00	20.00	70.00	140.00	450.00
27	1991	SPRING	10	132.00	5.0000	400.00	112.95	35.72	86	5.00	70.00	97.50	190.00	400.00
27	1991	SUMMER	13	165.96	12.500	590.00	180.96	50.19	109	12.50	25.00	50.00	280.00	590.00
27	1991	WINTER	13	97.50	5.0000	400.00	119.25	33.07	122	5.00	12.50	30.00	140.00	400.00
27	1992	FALL	12	80.83	5.0000	180.00	71.66	20.69	89	5.00	7.50	70.00	160.00	180.00
27	1992	SPRING	9	86.94	10.000	190.00	63.61	21.20	73	10.00	60.00	70.00	115.00	190.00
27	1992	SUMMER	13	98.08	5.0000	320.00	100.20	27.79	102	5.00	30.00	70.00	110.00	320.00
27	1992	WINTER	13	85.00	5.0000	250.00	83.24	23.09	98	5.00	5.00	85.00	130.00	250.00
32	1990	WINTER	3	136.67	10.000	290.00	141.89	81.92	104	10.00	10.00	110.00	290.00	290.00
32	1991	FALL	3	75.00	20.000	135.00	57.66	33.29	77	20.00	20.00	70.00	135.00	135.00
32	1991	SPRING	3	63.33	20.000	110.00	45.09	26.03	71	20.00	20.00	60.00	110.00	110.00
32	1991	SUMMER	3	81.67	5.0000	220.00	120.03	69.30	147	5.00	5.00	20.00	220.00	220.00
32	1991	WINTER	3	103.33	20.000	170.00	76.38	44.10	74	20.00	20.00	120.00	170.00	170.00
32	1992	SPRING	3	46.67	10.000	70.00	32.15	18.56	69	10.00	10.00	60.00	70.00	70.00
32	1992	SUMMER	3	30.00	20.000	40.00	10.00	5.77	33	20.00	20.00	30.00	40.00	40.00
32	1992	WINTER	3	126.67	25.000	225.00	100.04	57.76	79	25.00	25.00	130.00	225.00	225.00
42	1990	FALL	4	38.75	5.0000	120.00	54.52	27.26	141	5.00	7.50	15.00	70.00	120.00
42	1990	WINTER	4	12.50	5.0000	30.00	11.90	5.95	95	5.00	5.00	7.50	20.00	30.00
42	1991	FALL	5	41.50	5.0000	120.00	45.88	20.52	111	5.00	12.50	35.00	35.00	120.00
42	1991	SPRING	5	47.50	7.5000	150.00	59.74	26.72	126	7.50	10.00	20.00	50.00	150.00
42	1991	SUMMER	5	28.00	20.000	30.00	4.47	2.00	16	20.00	30.00	30.00	30.00	30.00

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1992
Phosph_Ortho_Tot_as_P_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	1991	WINTER	3	5.83	5.0000	7.50	1.44	0.83	25	5.00	5.00	5.00	7.50	7.50
42	1992	FALL	4	36.25	5.0000	90.00	37.28	18.64	103	5.00	12.50	25.00	60.00	90.00
42	1992	SPRING	4	49.38	30.000	90.00	28.31	14.16	57	30.00	30.00	38.75	68.75	90.00
42	1992	SUMMER	5	30.50	5.0000	60.00	21.10	9.43	69	5.00	17.50	30.00	40.00	60.00
42	1992	WINTER	4	41.88	7.5000	120.00	53.05	26.52	127	7.50	8.75	20.00	75.00	120.00

Aggregate Nutrient Ecoregion: V
Rivers and Streams
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from 1990 to 2000
Total_Nitrogen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1990	FALL	4	5.16	2.6000	12.00	4.57	2.29	89	2.60	2.63	3.03	7.70	12.00
25	1990	SPRING	4	5.43	3.4000	8.35	2.19	1.10	40	3.40	3.78	4.98	7.08	8.35
25	1990	SUMMER	4	5.08	1.2000	11.00	4.34	2.17	85	1.20	1.90	4.05	8.25	11.00
25	1990	WINTER	3	12.67	3.4000	30.00	15.02	8.67	119	3.40	3.40	4.60	30.00	30.00
25	1991	FALL	4	4.98	2.4500	10.00	3.41	1.70	68	2.45	3.03	3.73	6.93	10.00
25	1991	SPRING	4	5.65	3.3000	11.00	3.59	1.80	64	3.30	3.60	4.15	7.70	11.00
25	1991	SUMMER	4	3.08	2.6000	4.10	0.71	0.35	23	2.60	2.60	2.80	3.55	4.10
25	1991	WINTER	1	4.20	4.2000	4.20	.	.	.	4.20	4.20	4.20	4.20	4.20
25	1992	FALL	3	5.80	2.3000	11.00	4.59	2.65	79	2.30	2.30	4.10	11.00	11.00
25	1992	SPRING	4	3.96	2.5000	5.95	1.46	0.73	37	2.50	2.95	3.70	4.98	5.95
25	1992	SUMMER	4	3.68	1.6000	7.40	2.61	1.30	71	1.60	1.90	2.85	5.45	7.40
25	1992	WINTER	3	8.15	4.7000	14.00	5.09	2.94	62	4.70	4.70	5.75	14.00	14.00
25	1993	FALL	3	4.82	3.2000	7.90	2.67	1.54	55	3.20	3.20	3.35	7.90	7.90
25	1993	SPRING	4	5.11	2.5000	10.70	3.81	1.90	75	2.50	2.70	3.63	7.53	10.70
25	1993	SUMMER	4	3.65	1.6000	7.50	2.69	1.35	74	1.60	1.80	2.75	5.50	7.50
25	1993	WINTER	3	6.33	2.8000	11.50	4.57	2.64	72	2.80	2.80	4.70	11.50	11.50
25	1994	FALL	3	5.07	2.9000	9.00	3.41	1.97	67	2.90	2.90	3.30	9.00	9.00
25	1994	SPRING	4	5.03	3.5000	8.80	2.52	1.26	50	3.50	3.70	3.90	6.35	8.80
25	1994	SUMMER	4	3.88	1.1000	8.70	3.32	1.66	86	1.10	1.90	2.85	5.85	8.70
25	1994	WINTER	2	8.25	4.5000	12.00	5.30	3.75	64	4.50	4.50	8.25	12.00	12.00
25	1995	FALL	1	6.10	6.1000	6.10	.	.	.	6.10	6.10	6.10	6.10	6.10
25	1995	SPRING	2	6.73	3.8000	9.65	4.14	2.93	62	3.80	3.80	6.73	9.65	9.65
25	1995	SUMMER	2	1.95	1.7000	2.20	0.35	0.25	18	1.70	1.70	1.95	2.20	2.20
25	1995	WINTER	2	7.25	3.5000	11.00	5.30	3.75	73	3.50	3.50	7.25	11.00	11.00
25	1999	FALL	19	2.64	.40000	7.34	2.38	0.55	90	0.40	0.73	1.25	4.27	7.34
25	1999	SUMMER	20	1.95	.58000	4.66	1.41	0.32	72	0.58	1.02	1.30	3.59	4.66
25	2000	SPRING	10	2.05	.16000	5.67	1.96	0.62	96	0.16	0.57	1.14	3.21	5.67
27	1990	FALL	12	1.58	.30000	3.60	0.97	0.28	61	0.30	0.88	1.25	2.13	3.60
27	1990	SPRING	12	1.82	.65000	5.40	1.22	0.35	67	0.65	1.10	1.70	1.93	5.40
27	1990	SUMMER	38	0.89	.11000	8.40	1.54	0.25	173	0.11	0.11	0.35	0.90	4.00
27	1990	WINTER	38	1.60	.21000	4.56	1.00	0.16	62	0.30	0.91	1.36	2.10	4.26
27	1991	FALL	11	1.93	.40000	7.30	1.93	0.58	100	0.40	0.60	1.50	2.00	7.30

Aggregate Nutrient Ecoregion: V
Rivers and Streams
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from 1990 to 2000
Total_Nitrogen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
27	1991	SPRING	10	1.66	.85000	2.40	0.59	0.19	36	0.85	1.09	1.63	2.20	2.40
27	1991	SUMMER	39	1.52	.42500	5.70	1.24	0.20	82	0.47	0.79	0.89	2.15	4.89
27	1991	WINTER	36	1.22	.31000	3.18	0.78	0.13	64	0.43	0.58	0.81	1.77	2.72
27	1992	FALL	12	1.45	.20000	3.30	0.94	0.27	65	0.20	0.67	1.35	2.00	3.30
27	1992	SPRING	15	1.15	.34000	1.82	0.42	0.11	37	0.34	0.83	1.10	1.47	1.82
27	1992	SUMMER	35	1.21	.34000	3.49	0.68	0.11	56	0.34	0.73	1.01	1.71	2.30
27	1992	WINTER	32	1.43	.22000	4.68	0.92	0.16	64	0.26	0.86	1.29	1.75	2.87
27	1993	FALL	11	1.42	.20000	3.70	1.09	0.33	76	0.20	0.60	1.10	2.50	3.70
27	1993	SPRING	10	1.92	.80000	3.20	0.73	0.23	38	0.80	1.33	1.88	2.20	3.20
27	1993	SUMMER	13	1.60	.20000	3.70	1.05	0.29	65	0.20	0.90	1.45	1.90	3.70
27	1993	WINTER	27	1.64	.20000	3.71	0.88	0.17	54	0.34	0.92	1.66	2.26	2.70
27	1994	FALL	2	2.30	1.6000	3.00	0.99	0.70	43	1.60	1.60	2.30	3.00	3.00
27	1994	SPRING	8	1.48	.20000	2.60	0.86	0.30	58	0.20	0.85	1.45	2.23	2.60
27	1994	SUMMER	8	1.29	.20000	3.20	0.87	0.31	68	0.20	0.89	1.15	1.40	3.20
27	1994	WINTER	4	1.76	.60000	3.50	1.28	0.64	72	0.60	0.83	1.48	2.70	3.50
27	1995	SPRING	2	0.54	.30000	0.78	0.34	0.24	62	0.30	0.30	0.54	0.78	0.78
27	1995	SUMMER	3	0.82	.26000	1.50	0.63	0.36	76	0.26	0.26	0.71	1.50	1.50
27	1995	WINTER	2	1.95	1.8000	2.10	0.21	0.15	11	1.80	1.80	1.95	2.10	2.10
27	1999	FALL	16	1.85	.73000	2.99	0.85	0.21	46	0.73	1.21	1.51	2.81	2.99
27	1999	SUMMER	14	2.58	1.0100	10.20	2.30	0.62	89	1.01	1.48	2.16	2.71	10.20
27	2000	SPRING	8	1.78	.60000	2.89	0.86	0.30	48	0.60	1.09	1.75	2.53	2.89
32	1990	SPRING	3	0.90	.50000	1.20	0.36	0.21	40	0.50	0.50	1.00	1.20	1.20
32	1990	SUMMER	3	0.82	.50000	1.40	0.51	0.29	62	0.50	0.50	0.55	1.40	1.40
32	1990	WINTER	3	1.39	.45500	2.90	1.32	0.76	96	0.46	0.46	0.80	2.90	2.90
32	1991	FALL	2	1.60	1.6000	1.60	0.00	0.00	0	1.60	1.60	1.60	1.60	1.60
32	1991	SPRING	3	1.07	.72000	1.30	0.31	0.18	29	0.72	0.72	1.20	1.30	1.30
32	1991	SUMMER	3	1.35	.44000	2.80	1.27	0.73	94	0.44	0.44	0.80	2.80	2.80
32	1991	WINTER	3	2.20	1.5000	3.60	1.21	0.70	55	1.50	1.50	1.50	3.60	3.60
32	1992	SPRING	3	3.28	.85000	6.50	2.91	1.68	88	0.85	0.85	2.50	6.50	6.50
32	1992	SUMMER	3	1.25	.75000	2.10	0.74	0.43	59	0.75	0.75	0.90	2.10	2.10
32	1992	WINTER	3	1.85	.91000	2.90	1.00	0.58	54	0.91	0.91	1.75	2.90	2.90
32	1993	SPRING	3	1.13	.88500	1.40	0.26	0.15	23	0.89	0.89	1.10	1.40	1.40

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from 1990 to 2000
Total_Nitrogen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
32	1993	SUMMER	3	1.21	.50000	2.30	0.96	0.55	79	0.50	0.50	0.84	2.30	2.30
32	1993	WINTER	2	1.73	1.1600	2.30	0.81	0.57	47	1.16	1.16	1.73	2.30	2.30
32	1994	SPRING	1	1.80	1.8000	1.80	.	.	.	1.80	1.80	1.80	1.80	1.80
32	1994	SUMMER	1	0.57	.57000	0.57	.	.	.	0.57	0.57	0.57	0.57	0.57
32	1994	WINTER	1	0.56	.56000	0.56	.	.	.	0.56	0.56	0.56	0.56	0.56
42	1990	FALL	4	1.04	.50000	1.80	0.61	0.30	59	0.50	0.55	0.93	1.53	1.80
42	1990	SPRING	4	0.96	.60000	1.35	0.33	0.17	34	0.60	0.70	0.95	1.23	1.35
42	1990	SUMMER	5	1.03	.30000	1.45	0.45	0.20	44	0.30	0.90	1.20	1.30	1.45
42	1990	WINTER	4	0.94	.45000	1.20	0.35	0.18	38	0.45	0.68	1.05	1.20	1.20
42	1991	FALL	5	0.97	.50000	2.20	0.70	0.31	72	0.50	0.55	0.71	0.90	2.20
42	1991	SPRING	5	0.81	.50000	1.40	0.37	0.16	45	0.50	0.50	0.80	0.87	1.40
42	1991	SUMMER	5	0.84	.51000	1.10	0.24	0.11	28	0.51	0.70	0.90	1.00	1.10
42	1991	WINTER	2	0.90	.70000	1.10	0.28	0.20	31	0.70	0.70	0.90	1.10	1.10
42	1992	FALL	4	1.07	.60000	1.90	0.62	0.31	58	0.60	0.60	0.90	1.55	1.90
42	1992	SPRING	4	0.89	.30000	1.50	0.49	0.25	56	0.30	0.56	0.87	1.22	1.50
42	1992	SUMMER	5	1.01	.75000	1.20	0.18	0.08	18	0.75	0.90	1.10	1.10	1.20
42	1992	WINTER	4	0.83	.40000	1.80	0.66	0.33	79	0.40	0.45	0.55	1.20	1.80
42	1993	FALL	4	0.87	.40000	2.00	0.76	0.38	88	0.40	0.44	0.54	1.30	2.00
42	1993	SPRING	5	1.56	.70000	2.70	0.80	0.36	51	0.70	0.90	1.70	1.80	2.70
42	1993	SUMMER	5	0.85	.60000	1.40	0.32	0.14	38	0.60	0.65	0.75	0.85	1.40
42	1993	WINTER	3	1.36	.38000	2.50	1.07	0.62	79	0.38	0.38	1.20	2.50	2.50
42	1994	FALL	3	0.74	.40000	1.20	0.41	0.24	56	0.40	0.40	0.61	1.20	1.20
42	1994	SPRING	5	1.44	.95000	1.95	0.36	0.16	25	0.95	1.36	1.45	1.50	1.95
42	1994	SUMMER	5	0.84	.30000	1.50	0.43	0.19	52	0.30	0.70	0.78	0.90	1.50
42	1995	SPRING	1	0.70	.70000	0.70	.	.	.	0.70	0.70	0.70	0.70	0.70
42	1995	SUMMER	1	0.95	.95000	0.95	.	.	.	0.95	0.95	0.95	0.95	0.95
42	1999	FALL	8	1.82	.95000	3.97	1.07	0.38	59	0.95	1.17	1.17	2.48	3.97
42	1999	SUMMER	8	1.70	1.0400	2.95	0.61	0.22	36	1.04	1.37	1.40	2.04	2.95
42	2000	SPRING	4	1.91	1.1400	2.98	0.89	0.44	46	1.14	1.19	1.77	2.64	2.98

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Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1990	FALL	41	351.62	.00000	2350.00	532.28	83.13	151	10.00	30.00	100.00	470.00	1450.0
25	1990	SPRING	44	437.05	5.0000	2300.00	545.01	82.16	125	25.00	55.00	182.50	695.00	1700.0
25	1990	SUMMER	53	372.03	.00000	2300.00	501.11	68.83	135	10.00	70.00	170.00	510.00	1640.0
25	1990	WINTER	32	584.42	.00000	4700.00	936.71	165.59	160	9.00	40.00	140.00	800.00	1800.0
25	1991	FALL	40	489.81	2.5000	2400.00	655.48	103.64	134	10.00	60.00	242.50	820.00	2255.0
25	1991	SPRING	40	509.48	5.0000	3000.00	676.36	106.94	133	14.50	60.00	197.50	815.00	2025.0
25	1991	SUMMER	42	299.29	.00000	1200.00	291.35	44.96	97	10.00	105.00	195.00	460.00	1020.0
25	1991	WINTER	32	462.19	.00000	2000.00	563.69	99.65	122	5.00	40.00	180.00	705.00	1700.0
25	1992	FALL	30	479.21	16.250	2500.00	559.43	102.14	117	20.00	70.00	260.00	790.00	1350.0
25	1992	SPRING	35	402.82	2.5000	1500.00	431.11	72.87	107	10.00	100.00	210.00	610.00	1500.0
25	1992	SUMMER	36	375.00	2.5000	1950.00	426.39	71.07	114	2.50	145.00	240.00	475.00	1700.0
25	1992	WINTER	33	610.68	.00000	3600.00	760.17	132.33	124	10.00	90.00	400.00	865.00	2050.0
25	1993	FALL	46	352.25	.00000	2000.00	462.13	68.14	131	10.00	75.00	190.00	370.00	1700.0
25	1993	SPRING	44	471.56	2.5000	2550.00	533.05	80.36	113	30.00	105.00	287.50	677.50	1505.0
25	1993	SUMMER	44	283.64	2.5000	1350.00	281.98	42.51	99	20.00	80.00	210.00	365.00	660.00
25	1993	WINTER	37	567.64	5.0000	2950.00	622.16	102.28	110	10.00	80.00	320.00	895.00	1700.0
25	1994	FALL	36	384.48	6.2500	1700.00	492.45	82.08	128	20.00	40.00	177.50	522.50	1600.0
25	1994	SPRING	59	361.50	2.5000	1700.00	388.20	50.54	107	30.00	85.00	165.00	625.00	1450.0
25	1994	SUMMER	48	379.51	.00000	1400.00	372.24	53.73	98	20.00	110.00	270.00	465.00	1270.0
25	1994	WINTER	32	597.38	10.000	2000.00	583.48	103.15	98	10.00	100.00	370.00	1075.6	1900.0
25	1995	FALL	33	296.82	2.5000	1250.00	307.78	53.58	104	2.50	100.00	170.00	400.00	1100.0
25	1995	SPRING	35	433.57	10.000	1700.00	440.42	74.44	102	10.00	50.00	280.00	770.00	1500.0
25	1995	SUMMER	41	206.31	10.000	740.00	172.17	26.89	83	30.00	75.00	180.00	310.00	530.00
25	1995	WINTER	37	510.98	2.5000	2100.00	626.63	103.02	123	10.00	60.00	180.00	930.00	2100.0
25	1996	FALL	22	307.05	10.000	1700.00	386.71	82.45	126	10.00	80.00	140.00	440.00	785.00
25	1996	SPRING	22	378.52	2.5000	1900.00	497.47	106.06	131	20.00	65.00	100.00	560.00	1210.0
25	1996	SUMMER	24	292.19	2.5000	1100.00	294.98	60.21	101	20.00	90.00	202.50	410.00	1060.0
25	1996	WINTER	22	442.73	2.5000	1950.00	532.64	113.56	120	2.50	35.00	137.50	790.00	1200.0
25	1997	FALL	21	315.71	25.000	1400.00	310.15	67.68	98	30.00	135.00	180.00	460.00	600.00
25	1997	SPRING	21	310.24	20.000	1100.00	350.09	76.40	113	35.00	50.00	110.00	590.00	930.00
25	1997	SUMMER	20	214.00	40.000	510.00	126.07	28.19	59	45.00	137.50	190.00	282.50	485.00
25	1997	WINTER	20	339.50	10.000	1500.00	425.17	95.07	125	15.00	40.00	90.00	720.00	1210.0

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1998	WINTER	14	351.07	110.00	915.00	276.46	73.89	79	110.00	160.00	207.50	490.00	915.00
25	1999	FALL	19	67.40	30.890	226.12	62.82	14.41	93	30.89	38.14	39.59	65.26	226.12
25	1999	SUMMER	20	138.99	39.890	399.89	108.61	24.29	78	43.14	64.23	100.40	162.50	399.89
25	2000	SPRING	10	82.70	28.495	232.58	70.00	22.14	85	28.50	34.63	55.96	91.42	232.58
27	1990	FALL	84	339.11	10.000	2310.00	477.82	52.13	141	20.00	80.00	172.50	305.00	1615.0
27	1990	SPRING	93	351.57	30.000	2235.00	388.81	40.32	111	40.00	115.00	220.00	455.00	886.25
27	1990	SUMMER	118	351.40	20.000	1360.00	323.89	29.82	92	50.00	110.00	260.00	430.00	1180.0
27	1990	WINTER	66	279.55	30.000	2070.00	378.28	46.56	135	35.00	80.00	167.50	270.00	1025.0
27	1991	FALL	84	292.54	3.7500	2180.00	378.16	41.26	129	10.00	70.00	157.50	375.00	1100.0
27	1991	SPRING	92	340.76	10.000	1970.00	415.29	43.30	122	50.00	110.00	200.00	360.00	1550.0
27	1991	SUMMER	125	360.27	1.5000	2140.00	380.16	34.00	106	20.00	90.00	270.00	480.00	1085.0
27	1991	WINTER	120	230.38	1.5000	2070.00	347.92	31.76	151	4.88	30.00	100.00	245.00	1090.0
27	1992	FALL	99	266.00	2.5000	1775.00	305.67	30.72	115	10.00	75.00	170.00	315.00	900.00
27	1992	SPRING	107	283.21	2.5000	1620.00	323.35	31.26	114	10.00	70.00	190.00	330.00	1040.0
27	1992	SUMMER	143	502.67	1.5000	2350.00	556.64	46.55	111	20.00	90.00	240.00	760.00	1610.0
27	1992	WINTER	109	204.02	3.7500	2110.00	289.46	27.73	142	10.00	55.00	120.00	240.00	635.00
27	1993	FALL	96	231.09	10.000	1310.00	247.02	25.21	107	10.00	80.00	170.00	282.50	730.00
27	1993	SPRING	107	285.64	3.7500	1700.00	301.31	29.13	105	10.00	100.00	200.00	390.00	740.00
27	1993	SUMMER	119	397.92	10.000	2390.00	392.63	35.99	99	50.00	140.00	330.00	485.00	1250.0
27	1993	WINTER	109	197.84	10.000	1350.00	215.28	20.62	109	10.00	70.00	125.00	220.00	545.00
27	1994	FALL	101	279.86	2.5000	1450.00	313.59	31.20	112	20.00	75.00	175.00	320.00	1090.0
27	1994	SPRING	111	310.43	2.5000	1995.00	339.13	32.19	109	30.00	100.00	210.00	345.00	1200.0
27	1994	SUMMER	130	443.04	.00000	2300.00	427.48	37.49	96	55.00	160.00	295.00	600.00	1310.0
27	1994	WINTER	80	170.44	10.000	1640.00	229.12	25.62	134	10.00	47.50	132.50	187.50	475.00
27	1995	FALL	94	199.60	2.5000	1100.00	197.26	20.35	99	20.00	80.00	150.00	230.00	650.00
27	1995	SPRING	96	271.73	2.5000	1620.00	248.98	25.41	92	20.00	80.00	217.50	382.50	705.00
27	1995	SUMMER	99	330.57	2.5000	1365.00	283.08	28.45	86	30.00	120.00	270.00	435.00	890.00
27	1995	WINTER	82	164.10	2.5000	1460.00	237.05	26.18	144	2.50	30.00	85.00	200.00	560.00
27	1996	FALL	82	303.72	2.5000	1650.00	260.01	28.71	86	55.00	145.00	220.00	405.00	800.00
27	1996	SPRING	83	301.45	10.000	2420.00	375.27	41.19	124	20.00	105.00	210.00	345.00	840.00
27	1996	SUMMER	94	391.22	20.000	1550.00	305.74	31.54	78	50.00	160.00	325.00	570.00	930.00
27	1996	WINTER	48	137.92	2.5000	680.00	165.09	23.83	120	2.50	25.00	72.50	190.00	520.00

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
27	1997	FALL	70	402.64	30.000	1950.00	336.25	40.19	84	50.00	180.00	322.50	515.00	1140.0
27	1997	SPRING	75	217.83	2.5000	2100.00	267.48	30.89	123	20.00	90.00	150.00	260.00	580.00
27	1997	SUMMER	73	401.51	95.000	1500.00	250.41	29.31	62	110.00	250.00	335.00	470.00	860.00
27	1997	WINTER	75	170.43	2.5000	1555.00	194.68	22.48	114	11.25	60.00	125.00	215.00	380.00
27	1999	FALL	16	212.30	63.460	492.98	181.42	45.36	85	63.46	68.23	96.05	406.71	492.98
27	1999	SUMMER	14	155.13	77.890	359.84	82.65	22.09	53	77.89	88.37	130.53	224.21	359.84
27	2000	SPRING	8	296.87	100.44	917.40	298.82	105.65	101	100.44	124.10	157.78	396.70	917.40
32	1990	FALL	23	401.85	2.5000	1825.00	580.66	121.08	144	20.00	50.00	135.00	370.00	1800.0
32	1990	SPRING	35	303.64	2.5000	1670.00	367.35	62.09	121	20.00	90.00	160.00	305.00	1140.0
32	1990	SUMMER	46	299.46	2.5000	2380.00	475.92	70.17	159	10.00	40.00	107.50	240.00	1260.0
32	1990	WINTER	29	506.29	2.5000	2310.00	695.44	129.14	137	2.50	70.00	200.00	730.00	2300.0
32	1991	FALL	27	349.17	2.5000	1900.00	433.79	83.48	124	10.00	80.00	210.00	440.00	1220.0
32	1991	SPRING	51	346.69	20.000	2100.00	512.25	71.73	148	20.00	50.00	130.00	355.00	1730.0
32	1991	SUMMER	51	341.32	2.5000	2270.00	545.24	76.35	160	20.00	40.00	120.00	480.00	1830.0
32	1991	WINTER	30	324.25	2.5000	2060.00	463.54	84.63	143	30.00	70.00	145.00	260.00	1300.0
32	1992	FALL	25	490.00	20.000	4470.00	920.31	184.06	188	25.00	50.00	140.00	510.00	1500.0
32	1992	SPRING	41	233.54	10.000	1155.00	296.48	46.30	127	10.00	60.00	110.00	250.00	920.00
32	1992	SUMMER	50	357.35	2.5000	2310.00	534.24	75.55	150	5.00	30.00	95.00	450.00	1425.0
32	1992	WINTER	39	212.53	2.5000	970.00	206.40	33.05	97	20.00	70.00	130.00	280.00	640.00
32	1993	FALL	28	476.25	20.000	2080.00	553.04	104.52	116	20.00	45.00	240.00	742.50	1780.0
32	1993	SPRING	35	243.71	10.000	1410.00	348.81	58.96	143	10.00	30.00	70.00	340.00	965.00
32	1993	SUMMER	34	349.04	10.000	1700.00	483.20	82.87	138	15.00	30.00	95.00	490.00	1490.0
32	1993	WINTER	28	247.23	2.5000	1120.00	302.74	57.21	122	10.00	20.00	90.00	405.00	970.00
32	1994	FALL	31	299.19	10.000	1700.00	433.50	77.86	145	20.00	45.00	100.00	330.00	1300.0
32	1994	SPRING	48	305.83	2.5000	1540.00	406.88	58.73	133	10.00	40.00	110.00	340.00	1140.0
32	1994	SUMMER	34	289.41	20.000	1650.00	471.47	80.86	163	20.00	40.00	80.00	230.00	1650.0
32	1994	WINTER	40	299.31	2.5000	2400.00	508.63	80.42	170	20.00	30.00	50.00	375.00	1425.0
32	1995	FALL	28	389.29	10.000	1320.00	504.14	95.27	130	20.00	30.00	90.00	730.00	1295.0
32	1995	SPRING	39	193.14	2.5000	1470.00	270.62	43.33	140	20.00	40.00	115.00	220.00	730.00
32	1995	SUMMER	38	208.62	2.5000	1300.00	344.47	55.88	165	5.00	30.00	52.50	190.00	1300.0
32	1995	WINTER	37	236.05	2.5000	1680.00	394.54	64.86	167	2.50	20.00	50.00	150.00	1050.0
32	1996	FALL	7	114.64	2.5000	440.00	146.63	55.42	128	2.50	50.00	70.00	100.00	440.00

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
32	1996	SPRING	29	453.88	2.5000	2330.00	563.35	104.61	124	10.00	45.00	200.00	700.00	1880.0
32	1996	SUMMER	28	363.57	2.5000	1850.00	454.79	85.95	125	2.50	40.00	135.00	565.00	1020.0
32	1996	WINTER	26	566.20	10.000	2250.00	767.89	150.60	136	16.25	55.00	105.00	790.00	2170.0
32	1997	SPRING	6	221.25	2.5000	570.00	211.29	86.26	95	2.50	90.00	145.00	375.00	570.00
32	1997	WINTER	6	21.46	2.5000	55.00	24.68	10.07	115	2.50	2.50	9.38	50.00	55.00
42	1990	FALL	8	62.03	3.7500	190.00	62.78	22.20	101	3.75	16.25	40.00	95.00	190.00
42	1990	SPRING	13	123.04	20.000	409.50	108.55	30.11	88	20.00	40.00	90.00	160.00	409.50
42	1990	SUMMER	22	230.91	10.000	970.00	313.54	66.85	136	20.00	40.00	100.00	190.00	930.00
42	1990	WINTER	9	66.67	7.5000	165.00	59.12	19.71	89	7.50	20.00	50.00	105.00	165.00
42	1991	FALL	8	108.13	20.000	560.00	183.94	65.03	170	20.00	26.25	41.25	75.00	560.00
42	1991	SPRING	10	111.75	2.5000	270.00	84.62	26.76	76	2.50	50.00	87.50	180.00	270.00
42	1991	SUMMER	13	156.54	20.000	640.00	163.83	45.44	105	20.00	50.00	100.00	190.00	640.00
42	1991	WINTER	6	53.13	3.7500	150.00	53.49	21.84	101	3.75	10.00	42.50	70.00	150.00
42	1992	FALL	9	77.92	10.000	300.00	93.71	31.24	120	10.00	16.25	50.00	90.00	300.00
42	1992	SPRING	12	102.60	2.5000	390.00	130.00	37.53	127	2.50	15.00	25.00	165.00	390.00
42	1992	SUMMER	10	105.38	3.7500	290.00	103.35	32.68	98	3.75	30.00	65.00	220.00	290.00
42	1992	WINTER	6	76.67	10.000	330.00	125.01	51.03	163	10.00	10.00	30.00	50.00	330.00
42	1993	FALL	9	178.19	3.7500	630.00	220.56	73.52	124	3.75	45.00	70.00	240.00	630.00
42	1993	SPRING	16	251.22	22.000	880.00	272.86	68.21	109	22.00	38.00	107.50	410.00	880.00
42	1993	SUMMER	14	331.46	10.000	1270.00	412.02	110.12	124	10.00	80.00	130.00	380.00	1270.0
42	1993	WINTER	7	214.46	3.7500	830.00	311.53	117.75	145	3.75	30.00	67.50	450.00	830.00
42	1994	FALL	8	56.75	2.5000	169.00	59.47	21.03	105	2.50	3.75	47.50	90.00	169.00
42	1994	SPRING	9	201.67	20.000	750.00	226.81	75.60	112	20.00	35.00	155.00	210.00	750.00
42	1994	SUMMER	15	254.53	20.000	713.00	242.38	62.58	95	20.00	40.00	140.00	370.00	713.00
42	1994	WINTER	2	45.00	10.000	80.00	49.50	35.00	110	10.00	10.00	45.00	80.00	80.00
42	1995	FALL	6	158.17	2.5000	373.50	168.13	68.64	106	2.50	40.00	81.50	370.00	373.50
42	1995	SPRING	10	312.70	20.000	1060.50	318.57	100.74	102	20.00	90.00	240.00	410.00	1060.5
42	1995	SUMMER	15	217.57	4.0000	730.00	265.16	68.46	122	4.00	38.00	77.00	520.00	730.00
42	1995	WINTER	4	121.00	10.000	420.00	199.78	99.89	165	10.00	12.00	27.00	230.00	420.00
42	1996	FALL	5	65.00	2.5000	210.00	90.95	40.67	140	2.50	2.50	10.00	100.00	210.00
42	1996	SPRING	8	120.44	35.000	180.00	55.38	19.58	46	35.00	70.00	134.25	170.00	180.00
42	1996	SUMMER	9	300.56	30.000	735.00	280.48	93.49	93	30.00	60.00	290.00	485.00	735.00

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	1996	WINTER	2	177.50	60.000	295.00	166.17	117.50	94	60.00	60.00	177.50	295.00	295.00
42	1997	FALL	1	170.00	170.00	170.00	.	.	.	170.00	170.00	170.00	170.00	170.00
42	1997	SPRING	4	180.00	30.000	390.00	156.42	78.21	87	30.00	65.00	150.00	295.00	390.00
42	1997	SUMMER	2	295.00	140.00	450.00	219.20	155.00	74	140.00	140.00	295.00	450.00	450.00
42	1997	WINTER	4	347.50	30.000	845.00	370.15	185.07	107	30.00	67.50	257.50	627.50	845.00
42	1998	SPRING	1	140.00	140.00	140.00	.	.	.	140.00	140.00	140.00	140.00	140.00
42	1998	WINTER	1	50.00	50.000	50.00	.	.	.	50.00	50.00	50.00	50.00	50.00
42	1999	FALL	8	215.99	45.290	1080.00	350.88	124.05	162	45.29	68.83	94.26	138.24	1080.0
42	1999	SUMMER	8	352.91	78.470	1780.00	578.96	204.69	164	78.47	109.01	166.59	206.82	1780.0
42	1999	WINTER	4	117.50	16.000	296.00	122.98	61.49	105	16.00	42.00	79.00	193.00	296.00
42	2000	SPRING	4	327.77	160.84	737.00	274.24	137.12	84	160.84	172.93	206.62	482.62	737.00

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Turbidity_FTU

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1990	FALL	12	20.64	2.0000	63.00	21.36	6.17	103	2.00	4.75	11.15	36.80	63.00
25	1990	SPRING	15	21.50	2.6000	99.00	25.07	6.47	117	2.60	4.00	9.50	32.50	99.00
25	1990	SUMMER	15	22.89	1.0000	96.35	29.80	7.69	130	1.00	2.30	11.20	22.00	96.35
25	1990	WINTER	4	35.79	4.5000	97.00	42.04	21.02	117	4.50	8.65	20.83	62.93	97.00
25	1991	FALL	15	18.15	3.0000	101.00	29.89	7.72	165	3.00	4.10	5.00	9.00	101.00
25	1991	SPRING	15	17.14	2.0000	50.10	15.45	3.99	90	2.00	4.50	11.20	25.00	50.10
25	1991	SUMMER	14	21.47	5.0000	73.50	18.47	4.94	86	5.00	9.00	16.10	23.00	73.50
25	1991	WINTER	13	13.13	2.0000	38.00	11.55	3.20	88	2.00	4.00	9.95	19.00	38.00
25	1992	FALL	14	11.01	1.0000	63.00	16.09	4.30	146	1.00	3.00	4.63	15.50	63.00
25	1992	SPRING	15	19.03	1.1250	69.00	17.85	4.61	94	1.13	7.50	14.00	26.50	69.00
25	1992	SUMMER	14	20.19	2.0000	107.50	27.58	7.37	137	2.00	4.00	11.98	20.00	107.50
25	1992	WINTER	9	12.78	3.0000	25.70	7.36	2.45	58	3.00	7.00	11.20	17.00	25.70
25	1993	FALL	14	11.78	1.0000	38.00	12.77	3.41	108	1.00	2.00	5.50	23.00	38.00
25	1993	SPRING	14	15.79	3.0000	38.00	11.27	3.01	71	3.00	8.00	11.53	25.00	38.00
25	1993	SUMMER	15	20.97	1.0000	95.00	29.06	7.50	139	1.00	3.00	6.00	34.00	95.00
25	1993	WINTER	10	10.42	.25000	37.50	12.17	3.85	117	0.25	1.00	7.10	12.20	37.50
25	1994	FALL	13	20.51	1.2000	131.00	39.66	11.00	193	1.20	2.00	4.00	9.00	131.00
25	1994	SPRING	15	14.77	3.0000	42.00	12.87	3.32	87	3.00	5.00	9.50	26.50	42.00
25	1994	SUMMER	14	27.43	.60000	131.00	42.99	11.49	157	0.60	4.00	6.20	17.00	131.00
25	1994	WINTER	11	5.82	1.0000	25.00	6.73	2.03	116	1.00	2.80	3.30	7.70	25.00
25	1995	FALL	12	12.59	2.0000	61.50	17.49	5.05	139	2.00	2.50	5.33	14.15	61.50
25	1995	SPRING	13	18.29	2.0000	94.00	25.81	7.16	141	2.00	3.00	6.00	32.00	94.00
25	1995	SUMMER	13	15.12	2.0000	76.00	20.59	5.71	136	2.00	4.00	6.50	12.00	76.00
25	1995	WINTER	8	5.23	.60000	11.00	4.26	1.51	81	0.60	1.45	4.15	9.50	11.00
25	1996	FALL	12	16.79	3.0000	103.00	29.36	8.48	175	3.00	3.75	5.00	11.00	103.00
25	1996	SPRING	12	8.14	1.0000	19.50	6.04	1.74	74	1.00	4.53	6.95	9.98	19.50
25	1996	SUMMER	13	32.92	1.0000	139.50	46.56	12.91	141	1.00	4.00	7.00	55.00	139.50
25	1996	WINTER	11	10.65	1.0000	70.00	20.31	6.12	191	1.00	1.00	3.50	13.70	70.00
25	1997	FALL	12	28.53	6.5000	81.00	23.74	6.85	83	6.50	9.05	18.00	45.50	81.00
25	1997	SPRING	13	16.72	2.6000	60.00	16.88	4.68	101	2.60	6.00	8.50	28.50	60.00
25	1997	SUMMER	11	25.36	6.0000	70.00	19.94	6.01	79	6.00	11.00	21.50	27.50	70.00
25	1997	WINTER	13	11.42	2.0000	52.00	14.33	3.97	125	2.00	4.50	7.00	9.00	52.00

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Turbidity_FTU

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1998	WINTER	6	8.17	2.0000	31.00	11.29	4.61	138	2.00	2.00	4.00	6.00	31.00
27	1990	FALL	64	21.06	1.7000	150.00	22.80	2.85	108	2.50	5.00	15.68	28.78	57.00
27	1990	SPRING	68	35.41	2.4000	122.00	25.77	3.12	73	5.00	14.55	29.63	50.75	84.00
27	1990	SUMMER	49	40.83	2.0000	184.00	42.58	6.08	104	3.20	12.80	27.00	53.60	124.00
27	1990	WINTER	19	23.50	2.2000	150.00	34.37	7.88	146	2.20	5.50	15.00	21.50	150.00
27	1991	FALL	69	15.47	1.1500	104.25	16.12	1.94	104	2.00	6.00	11.50	17.00	42.00
27	1991	SPRING	69	28.21	2.2000	92.45	21.10	2.54	75	4.00	11.00	22.00	40.55	71.00
27	1991	SUMMER	75	34.61	1.0000	100.00	24.47	2.83	71	5.00	13.80	30.40	50.20	89.90
27	1991	WINTER	74	12.00	1.8000	48.10	10.07	1.17	84	2.75	5.00	9.38	13.30	37.30
27	1992	FALL	70	17.94	2.5500	84.50	15.38	1.84	86	3.50	6.40	14.38	23.60	47.00
27	1992	SPRING	73	23.87	2.8000	175.00	24.74	2.90	104	4.25	9.00	17.75	27.55	67.00
27	1992	SUMMER	52	46.47	3.1000	177.00	37.02	5.13	80	3.60	19.30	39.25	68.63	113.00
27	1992	WINTER	73	15.03	2.0000	59.00	13.44	1.57	89	2.80	5.90	10.00	19.50	47.00
27	1993	FALL	76	25.51	1.0000	163.00	30.67	3.52	120	1.40	7.50	15.50	31.50	102.50
27	1993	SPRING	78	42.63	5.3000	121.00	32.80	3.71	77	6.90	19.40	30.50	62.00	119.00
27	1993	SUMMER	88	49.24	1.1000	160.00	35.26	3.76	72	3.50	22.20	41.75	74.75	115.00
27	1993	WINTER	67	23.43	1.3000	165.00	27.26	3.33	116	2.30	7.50	16.00	28.00	82.05
27	1994	FALL	70	19.68	1.0000	84.00	18.18	2.17	92	2.50	7.00	14.75	25.50	58.00
27	1994	SPRING	71	25.80	.80000	77.50	17.26	2.05	67	3.00	12.65	22.30	35.25	59.50
27	1994	SUMMER	71	45.78	.50000	185.00	40.00	4.75	87	1.50	14.00	34.00	70.50	137.00
27	1994	WINTER	59	8.53	1.0000	40.00	7.98	1.04	94	1.60	3.10	5.10	11.20	27.00
27	1995	FALL	71	12.52	.80000	109.00	15.30	1.82	122	2.00	4.50	8.90	14.00	32.00
27	1995	SPRING	75	27.88	1.4500	112.00	30.23	3.49	108	2.00	5.00	17.50	42.00	101.00
27	1995	SUMMER	78	29.92	.90000	146.00	30.97	3.51	104	3.30	10.00	18.75	37.50	96.50
27	1995	WINTER	68	5.14	.70000	43.00	5.53	0.67	108	1.50	2.47	3.50	6.05	10.95
27	1996	FALL	64	34.66	2.0000	174.00	36.32	4.54	105	3.50	9.50	21.25	45.75	86.00
27	1996	SPRING	66	22.14	3.0000	115.00	21.14	2.60	95	3.85	7.90	16.25	27.00	60.00
27	1996	SUMMER	59	62.39	2.5000	190.00	47.08	6.13	75	6.00	28.00	51.00	86.00	170.00
27	1996	WINTER	31	5.64	.70000	34.50	6.22	1.12	110	1.20	2.60	3.75	6.00	15.50
27	1997	FALL	62	35.50	2.4000	185.00	44.48	5.65	125	3.80	8.90	15.00	39.00	150.00
27	1997	SPRING	69	19.20	2.0000	100.00	19.36	2.33	101	3.10	7.30	13.50	21.50	63.00
27	1997	SUMMER	69	53.88	6.2500	142.00	30.04	3.62	56	10.25	35.00	52.00	71.50	112.50

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Turbidity_FTU

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
27	1997	WINTER	71	16.13	1.0000	142.00	22.85	2.71	142	1.50	4.00	8.50	20.00	46.00
32	1990	FALL	12	33.95	3.5000	125.00	36.99	10.68	109	3.50	7.20	20.50	45.00	125.00
32	1990	SPRING	19	44.33	1.4000	140.00	42.09	9.66	95	1.40	4.50	46.50	70.00	140.00
32	1990	SUMMER	20	17.84	.60000	120.00	27.90	6.24	156	0.90	3.25	8.90	18.15	91.25
32	1990	WINTER	13	26.98	1.9000	150.00	43.73	12.13	162	1.90	3.80	14.00	17.50	150.00
32	1991	FALL	15	29.42	2.4000	95.00	35.00	9.04	119	2.40	3.60	7.40	59.50	95.00
32	1991	SPRING	17	38.80	2.0000	155.00	39.39	9.55	102	2.00	13.00	28.00	52.00	155.00
32	1991	SUMMER	17	27.72	2.0000	100.00	29.66	7.19	107	2.00	4.30	15.00	33.00	100.00
32	1991	WINTER	16	39.95	2.0000	130.00	42.40	10.60	106	2.00	8.70	20.75	64.00	130.00
32	1992	FALL	10	17.45	1.2000	84.00	25.34	8.01	145	1.20	2.40	8.00	20.00	84.00
32	1992	SPRING	20	38.75	1.0000	160.00	42.94	9.60	111	2.35	7.85	26.75	51.00	133.75
32	1992	SUMMER	18	19.83	.90000	67.00	20.79	4.90	105	0.90	6.05	11.28	28.50	67.00
32	1992	WINTER	21	53.34	5.2000	150.00	44.61	9.74	84	8.50	16.00	37.00	68.15	142.00
32	1993	FALL	2	3.90	1.5000	6.30	3.39	2.40	87	1.50	1.50	3.90	6.30	6.30
32	1993	SPRING	8	18.89	1.0000	72.00	23.68	8.37	125	1.00	1.80	12.25	25.00	72.00
32	1993	SUMMER	6	10.83	1.2000	26.00	11.91	4.86	110	1.20	1.80	5.00	26.00	26.00
32	1993	WINTER	10	30.13	1.5000	150.00	47.28	14.95	157	1.50	4.10	11.10	29.50	150.00
32	1994	FALL	3	42.87	.90000	120.00	66.89	38.62	156	0.90	0.90	7.70	120.00	120.00
32	1994	SPRING	2	95.35	.70000	190.00	133.86	94.65	140	0.70	0.70	95.35	190.00	190.00
32	1994	SUMMER	4	2.58	1.8000	3.40	0.75	0.38	29	1.80	1.95	2.55	3.20	3.40
32	1994	WINTER	3	39.13	1.9000	110.00	61.40	35.45	157	1.90	1.90	5.50	110.00	110.00
32	1995	FALL	2	3.48	2.8000	4.15	0.95	0.68	27	2.80	2.80	3.48	4.15	4.15
32	1995	SPRING	4	59.96	3.0500	136.00	65.62	32.81	109	3.05	5.18	50.40	114.75	136.00
32	1995	SUMMER	3	5.17	4.0000	5.80	1.01	0.58	20	4.00	4.00	5.70	5.80	5.80
32	1995	WINTER	2	2.25	2.2000	2.30	0.07	0.05	3	2.20	2.20	2.25	2.30	2.30
32	1996	SPRING	1	1.00	1.0000	1.00	.	.	.	1.00	1.00	1.00	1.00	1.00
32	1996	WINTER	1	98.00	98.000	98.00	.	.	.	98.00	98.00	98.00	98.00	98.00
32	1997	SPRING	1	5.10	5.1000	5.10	.	.	.	5.10	5.10	5.10	5.10	5.10
32	1997	WINTER	2	1.05	.30000	1.80	1.06	0.75	101	0.30	0.30	1.05	1.80	1.80
42	1990	FALL	6	20.26	2.0000	87.00	33.00	13.47	163	2.00	3.90	7.33	14.00	87.00
42	1990	SPRING	7	24.37	2.6000	65.00	24.12	9.12	99	2.60	4.00	16.00	51.00	65.00
42	1990	SUMMER	7	22.04	3.0000	44.00	16.13	6.10	73	3.00	4.80	24.50	40.00	44.00

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Turbidity_FTU

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	1990	WINTER	5	5.65	1.5000	10.00	3.44	1.54	61	1.50	3.75	4.75	8.25	10.00
42	1991	FALL	7	23.45	2.0000	100.00	34.90	13.19	149	2.00	5.00	9.90	29.00	100.00
42	1991	SPRING	7	35.86	2.0000	140.00	47.89	18.10	134	2.00	2.55	20.00	37.50	140.00
42	1991	SUMMER	6	33.38	2.3000	90.00	33.84	13.81	101	2.30	4.00	24.00	56.00	90.00
42	1991	WINTER	4	4.88	3.3000	6.20	1.49	0.75	31	3.30	3.60	5.00	6.15	6.20
42	1992	FALL	6	20.42	.25000	77.00	29.01	11.84	142	0.25	3.50	9.38	23.00	77.00
42	1992	SPRING	4	9.63	2.0000	20.75	8.95	4.48	93	2.00	2.38	7.88	16.88	20.75
42	1992	SUMMER	6	32.05	2.0000	73.00	27.77	11.34	87	2.00	2.30	32.00	51.00	73.00
42	1992	WINTER	5	27.05	2.4000	99.00	40.55	18.13	150	2.40	6.30	11.55	16.00	99.00
42	1993	FALL	6	23.58	.80000	48.00	20.65	8.43	88	0.80	1.70	26.00	39.00	48.00
42	1993	SPRING	6	32.96	.25000	77.00	30.18	12.32	92	0.25	1.50	32.50	54.00	77.00
42	1993	SUMMER	6	37.79	2.2500	88.00	33.70	13.76	89	2.25	3.00	35.00	63.50	88.00
42	1993	WINTER	4	3.38	2.1500	6.55	2.12	1.06	63	2.15	2.23	2.40	4.53	6.55
42	1994	FALL	4	13.63	2.5000	26.00	12.62	6.31	93	2.50	2.75	13.00	24.50	26.00
42	1994	SPRING	6	39.33	.75000	81.50	37.14	15.16	94	0.75	3.00	38.63	73.50	81.50
42	1994	SUMMER	7	20.34	1.1500	68.00	22.89	8.65	113	1.15	3.00	18.00	23.50	68.00
42	1994	WINTER	1	4.40	4.4000	4.40	.	.	.	4.40	4.40	4.40	4.40	4.40
42	1995	FALL	3	9.40	1.2000	22.00	11.08	6.39	118	1.20	1.20	5.00	22.00	22.00
42	1995	SPRING	2	14.55	7.1000	22.00	10.54	7.45	72	7.10	7.10	14.55	22.00	22.00
42	1995	SUMMER	3	15.05	3.0000	38.00	19.88	11.48	132	3.00	3.00	4.15	38.00	38.00
42	1995	WINTER	1	4.90	4.9000	4.90	.	.	.	4.90	4.90	4.90	4.90	4.90
42	1996	FALL	1	2.00	2.0000	2.00	.	.	.	2.00	2.00	2.00	2.00	2.00
42	1996	SPRING	3	12.40	1.2000	33.00	17.86	10.31	144	1.20	1.20	3.00	33.00	33.00
42	1996	SUMMER	2	2.70	2.4000	3.00	0.42	0.30	16	2.40	2.40	2.70	3.00	3.00
42	1997	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
42	1997	SUMMER	1	3.00	3.0000	3.00	.	.	.	3.00	3.00	3.00	3.00	3.00

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1993
Turbidity_JCU

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
27	1990	FALL	7	13.51	2.8000	31.75	10.72	4.05	79	2.80	2.80	14.00	22.00	31.75
27	1990	SPRING	13	44.28	4.0000	98.00	33.14	9.19	75	4.00	14.00	44.00	74.00	98.00
27	1990	SUMMER	28	58.95	2.0000	210.00	60.11	11.36	102	2.00	12.50	25.75	100.25	185.00
27	1990	WINTER	30	33.37	4.4000	170.00	32.86	6.00	98	5.90	13.00	24.50	46.00	74.90
27	1991	FALL	9	49.17	.50000	173.00	63.05	21.02	128	0.50	10.00	17.00	59.00	173.00
27	1991	SPRING	13	89.08	2.5000	300.00	90.09	24.99	101	2.50	16.00	92.00	120.00	300.00
27	1991	SUMMER	33	36.24	2.0000	220.00	45.96	8.00	127	2.00	6.95	20.50	47.00	126.00
27	1991	WINTER	32	11.09	1.5000	45.00	9.36	1.65	84	1.80	4.75	8.00	14.25	27.00
27	1992	FALL	7	14.62	1.1000	32.55	14.07	5.32	96	1.10	1.20	11.30	31.00	32.55
27	1992	SPRING	12	31.38	3.0000	165.00	48.58	14.02	155	3.00	5.95	13.00	24.25	165.00
27	1992	SUMMER	26	43.82	1.5000	274.00	68.35	13.41	156	2.00	4.35	16.70	39.00	227.00
27	1992	WINTER	22	22.40	3.0000	80.00	22.89	4.88	102	3.00	8.00	11.75	35.00	65.00
27	1993	WINTER	18	50.29	4.7000	229.00	54.84	12.93	109	4.70	12.60	34.80	67.70	229.00
42	1990	SUMMER	7	29.69	.25000	140.00	49.64	18.76	167	0.25	3.00	9.00	26.00	140.00
42	1991	SUMMER	1	7.40	7.4000	7.40	.	.	.	7.40	7.40	7.40	7.40	7.40

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Turbidity_NTU

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1990	FALL	2	10.20	7.8000	12.60	3.39	2.40	33	7.80	7.80	10.20	12.60	12.60
25	1990	SPRING	2	4.30	3.0000	5.60	1.84	1.30	43	3.00	3.00	4.30	5.60	5.60
25	1990	SUMMER	1	2.00	2.0000	2.00	.	.	.	2.00	2.00	2.00	2.00	2.00
25	1993	FALL	1	4.00	4.0000	4.00	.	.	.	4.00	4.00	4.00	4.00	4.00
25	1994	FALL	1	15.00	15.000	15.00	.	.	.	15.00	15.00	15.00	15.00	15.00
25	1994	SPRING	2	5.00	2.0000	8.00	4.24	3.00	85	2.00	2.00	5.00	8.00	8.00
25	1994	SUMMER	4	11.50	2.0000	21.00	8.96	4.48	78	2.00	4.00	11.50	19.00	21.00
25	1996	FALL	1	4.80	4.8000	4.80	.	.	.	4.80	4.80	4.80	4.80	4.80
25	1997	FALL	1	12.30	12.300	12.30	.	.	.	12.30	12.30	12.30	12.30	12.30
25	1999	FALL	19	34.53	1.0000	72.50	23.88	5.48	69	1.00	17.00	35.00	53.00	72.50
25	1999	SUMMER	20	108.35	18.000	343.00	101.98	22.80	94	22.25	50.00	65.00	116.00	343.00
25	2000	SPRING	10	122.10	4.0000	941.00	288.46	91.22	236	4.00	16.00	30.00	53.00	941.00
25	2000	SUMMER	10	107.25	7.0000	735.00	221.97	70.19	207	7.00	15.00	41.25	70.00	735.00
27	1990	FALL	10	21.92	7.0000	43.60	12.61	3.99	58	7.00	10.00	22.58	29.40	43.60
27	1990	SPRING	10	52.53	3.0000	123.60	41.78	13.21	80	3.00	13.20	47.00	90.70	123.60
27	1990	SUMMER	19	46.47	6.0000	190.00	40.84	9.37	88	6.00	25.00	33.00	65.00	190.00
27	1991	SUMMER	2	22.00	19.000	25.00	4.24	3.00	19	19.00	19.00	22.00	25.00	25.00
27	1992	FALL	1	42.00	42.000	42.00	.	.	.	42.00	42.00	42.00	42.00	42.00
27	1992	SUMMER	1	84.00	84.000	84.00	.	.	.	84.00	84.00	84.00	84.00	84.00
27	1993	SUMMER	2	16.50	10.000	23.00	9.19	6.50	56	10.00	10.00	16.50	23.00	23.00
27	1994	FALL	8	29.50	8.0000	78.00	23.46	8.29	80	8.00	10.50	25.00	39.50	78.00
27	1994	SUMMER	25	53.24	2.0000	157.00	40.14	8.03	75	3.00	26.00	49.00	74.00	118.00
27	1995	FALL	6	56.17	12.000	137.00	42.73	17.44	76	12.00	34.00	49.00	56.00	137.00
27	1995	SPRING	2	67.60	66.200	69.00	1.98	1.40	3	66.20	66.20	67.60	69.00	69.00
27	1995	SUMMER	2	86.50	68.500	104.50	25.46	18.00	29	68.50	68.50	86.50	104.50	104.50
27	1996	FALL	11	16.65	6.8000	53.00	14.60	4.40	88	6.80	7.80	8.90	22.70	53.00
27	1996	SPRING	2	13.40	1.4000	25.40	16.97	12.00	127	1.40	1.40	13.40	25.40	25.40
27	1996	SUMMER	11	28.34	5.5000	76.65	22.12	6.67	78	5.50	12.90	19.85	38.95	76.65
27	1999	FALL	16	49.19	3.0000	230.00	72.10	18.03	147	3.00	15.00	19.50	45.75	230.00
27	1999	SUMMER	14	60.25	12.000	144.00	44.03	11.77	73	12.00	23.00	57.25	76.00	144.00
27	2000	SPRING	8	78.06	38.000	179.00	51.09	18.06	65	38.00	43.00	60.75	100.00	179.00
27	2000	SUMMER	8	113.00	7.0000	226.00	68.02	24.05	60	7.00	72.50	104.50	158.50	226.00

Aggregate Nutrient Ecoregion: V
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Turbidity_NTU

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	1991	SUMMER	1	10.70	10.700	10.70	.	.	.	10.70	10.70	10.70	10.70	10.70
42	1992	FALL	1	2.10	2.1000	2.10	.	.	.	2.10	2.10	2.10	2.10	2.10
42	1994	SUMMER	5	29.00	2.0000	120.00	50.94	22.78	176	2.00	6.00	8.00	9.00	120.00
42	1999	FALL	7	55.14	30.000	104.00	26.70	10.09	48	30.00	30.00	43.00	68.00	104.00
42	1999	SUMMER	7	73.71	6.0000	150.00	60.27	22.78	82	6.00	6.00	50.00	127.00	150.00
42	2000	SPRING	3	95.00	45.000	142.00	48.57	28.04	51	45.00	45.00	98.00	142.00	142.00
42	2000	SUMMER	3	126.00	25.000	258.00	119.55	69.02	95	25.00	25.00	95.00	258.00	258.00

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
pH_S_U

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
25	1993	FALL	8	8.17	7.9000	8.35	0.16	0.06	2	7.90	8.03	8.23	8.30	8.35
25	1993	SPRING	7	8.13	8.0000	8.40	0.14	0.05	2	8.00	8.00	8.10	8.20	8.40
25	1993	SUMMER	7	8.11	7.8000	8.35	0.17	0.07	2	7.80	8.00	8.10	8.20	8.35
25	1993	WINTER	7	8.11	7.9000	8.50	0.24	0.09	3	7.90	7.90	8.00	8.40	8.50
25	1994	FALL	7	8.06	7.5000	8.25	0.27	0.10	3	7.50	8.00	8.20	8.25	8.25
25	1994	SPRING	7	8.23	7.9000	8.40	0.18	0.07	2	7.90	8.10	8.30	8.35	8.40
25	1994	SUMMER	8	8.08	7.8000	8.40	0.18	0.06	2	7.80	7.98	8.08	8.15	8.40
25	1994	WINTER	7	8.21	7.8000	8.40	0.22	0.08	3	7.80	8.10	8.20	8.40	8.40
25	1995	FALL	4	8.00	7.7000	8.30	0.26	0.13	3	7.70	7.80	8.00	8.20	8.30
25	1995	SPRING	7	8.08	7.9000	8.30	0.16	0.06	2	7.90	7.90	8.05	8.20	8.30
25	1995	SUMMER	7	7.91	7.6000	8.10	0.17	0.06	2	7.60	7.80	7.90	8.05	8.10
25	1995	WINTER	7	8.08	7.7500	8.40	0.21	0.08	3	7.75	7.95	8.10	8.25	8.40
25	1996	FALL	1	8.10	8.1000	8.10	.	.	.	8.10	8.10	8.10	8.10	8.10
25	1996	WINTER	1	7.95	7.9500	7.95	.	.	.	7.95	7.95	7.95	7.95	7.95
25	1997	FALL	1	8.30	8.3000	8.30	.	.	.	8.30	8.30	8.30	8.30	8.30
25	1999	FALL	19	8.21	7.9900	8.39	0.14	0.03	2	7.99	8.10	8.25	8.30	8.39
25	1999	SUMMER	20	8.26	7.8300	8.71	0.32	0.07	4	7.84	7.90	8.26	8.58	8.71
25	2000	SPRING	10	8.53	7.9000	9.70	0.50	0.16	6	7.90	8.28	8.52	8.64	9.70
25	2000	SUMMER	10	9.80	8.2200	10.60	0.90	0.28	9	8.22	8.80	10.25	10.40	10.60
27	1992	SPRING	2	7.75	7.5000	8.00	0.35	0.25	5	7.50	7.50	7.75	8.00	8.00
27	1992	SUMMER	1	7.90	7.9000	7.90	.	.	.	7.90	7.90	7.90	7.90	7.90
27	1993	FALL	5	8.21	7.8000	8.50	0.26	0.12	3	7.80	8.15	8.30	8.30	8.50
27	1993	SPRING	5	8.08	7.7000	8.40	0.31	0.14	4	7.70	7.80	8.20	8.30	8.40
27	1993	SUMMER	5	8.21	7.8000	8.55	0.34	0.15	4	7.80	7.90	8.30	8.50	8.55
27	1993	WINTER	5	8.34	7.8000	8.90	0.42	0.19	5	7.80	8.10	8.40	8.50	8.90
27	1994	FALL	5	8.35	8.1000	8.80	0.29	0.13	3	8.10	8.10	8.30	8.45	8.80
27	1994	SPRING	5	8.37	8.0000	8.80	0.29	0.13	3	8.00	8.25	8.35	8.45	8.80
27	1994	SUMMER	5	8.39	7.9500	8.80	0.41	0.18	5	7.95	8.00	8.40	8.80	8.80
27	1994	WINTER	5	7.95	7.2500	8.40	0.44	0.20	6	7.25	7.85	8.05	8.20	8.40
27	1995	FALL	1	8.00	8.0000	8.00	.	.	.	8.00	8.00	8.00	8.00	8.00
27	1995	SPRING	3	8.33	8.2000	8.40	0.12	0.07	1	8.20	8.20	8.40	8.40	8.40
27	1995	SUMMER	3	8.57	8.3500	8.80	0.23	0.13	3	8.35	8.35	8.55	8.80	8.80

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
pH_S_U

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
27	1995	WINTER	1	8.45	8.4500	8.45	.	.	.	8.45	8.45	8.45	8.45	8.45
27	1999	FALL	16	8.11	7.7700	8.46	0.25	0.06	3	7.77	7.87	8.14	8.33	8.46
27	1999	SUMMER	14	8.08	7.1900	8.63	0.41	0.11	5	7.19	7.71	8.23	8.31	8.63
27	2000	SPRING	8	8.15	7.8100	8.50	0.24	0.09	3	7.81	7.94	8.16	8.34	8.50
27	2000	SUMMER	8	9.03	8.1100	10.20	0.81	0.29	9	8.11	8.41	8.71	9.83	10.20
32	1991	FALL	1	7.90	7.9000	7.90	.	.	.	7.90	7.90	7.90	7.90	7.90
32	1991	WINTER	2	7.95	7.7000	8.20	0.35	0.25	4	7.70	7.70	7.95	8.20	8.20
32	1992	FALL	2	7.40	7.2000	7.60	0.28	0.20	4	7.20	7.20	7.40	7.60	7.60
32	1992	SPRING	2	7.85	7.7000	8.00	0.21	0.15	3	7.70	7.70	7.85	8.00	8.00
32	1992	SUMMER	2	7.80	7.5000	8.10	0.42	0.30	5	7.50	7.50	7.80	8.10	8.10
32	1992	WINTER	2	7.90	7.7000	8.10	0.28	0.20	4	7.70	7.70	7.90	8.10	8.10
32	1993	FALL	3	7.80	7.7000	7.90	0.10	0.06	1	7.70	7.70	7.80	7.90	7.90
32	1993	SPRING	3	7.83	7.5000	8.00	0.29	0.17	4	7.50	7.50	8.00	8.00	8.00
32	1993	SUMMER	3	7.73	7.7000	7.80	0.06	0.03	1	7.70	7.70	7.70	7.80	7.80
32	1993	WINTER	3	7.63	7.5000	7.70	0.12	0.07	2	7.50	7.50	7.70	7.70	7.70
32	1994	FALL	3	7.77	7.6000	7.90	0.15	0.09	2	7.60	7.60	7.80	7.90	7.90
32	1994	SPRING	3	7.70	7.5000	7.80	0.17	0.10	2	7.50	7.50	7.80	7.80	7.80
32	1994	SUMMER	3	7.45	7.2500	7.60	0.18	0.10	2	7.25	7.25	7.50	7.60	7.60
32	1994	WINTER	3	7.83	7.7500	7.90	0.08	0.04	1	7.75	7.75	7.85	7.90	7.90
32	1995	FALL	2	7.50	7.5000	7.50	0.00	0.00	0	7.50	7.50	7.50	7.50	7.50
32	1995	SPRING	3	7.73	7.7000	7.80	0.06	0.03	1	7.70	7.70	7.70	7.80	7.80
32	1995	SUMMER	3	7.62	7.4000	7.80	0.20	0.12	3	7.40	7.40	7.65	7.80	7.80
32	1995	WINTER	3	7.92	7.7000	8.05	0.19	0.11	2	7.70	7.70	8.00	8.05	8.05
32	1996	SPRING	2	7.38	7.3000	7.45	0.11	0.08	1	7.30	7.30	7.38	7.45	7.45
32	1996	SUMMER	2	7.43	7.4000	7.45	0.04	0.02	0	7.40	7.40	7.43	7.45	7.45
32	1996	WINTER	2	7.60	7.3500	7.85	0.35	0.25	5	7.35	7.35	7.60	7.85	7.85
42	1990	FALL	2	5.20	2.8000	7.60	3.39	2.40	65	2.80	2.80	5.20	7.60	7.60
42	1990	SPRING	1	7.79	7.7900	7.79	.	.	.	7.79	7.79	7.79	7.79	7.79
42	1990	SUMMER	7	8.38	7.5500	8.88	0.43	0.16	5	7.55	8.26	8.37	8.75	8.88
42	1990	WINTER	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
42	1991	FALL	1	7.80	7.8000	7.80	.	.	.	7.80	7.80	7.80	7.80	7.80
42	1991	SPRING	1	7.70	7.7000	7.70	.	.	.	7.70	7.70	7.70	7.70	7.70

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
pH_S_U

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
42	1991	SUMMER	4	8.45	7.9000	8.77	0.38	0.19	5	7.90	8.19	8.57	8.71	8.77
42	1992	FALL	1	7.80	7.8000	7.80	.	.	.	7.80	7.80	7.80	7.80	7.80
42	1992	SUMMER	1	7.60	7.6000	7.60	.	.	.	7.60	7.60	7.60	7.60	7.60
42	1992	WINTER	1	7.16	7.1600	7.16	.	.	.	7.16	7.16	7.16	7.16	7.16
42	1993	FALL	1	7.40	7.4000	7.40	.	.	.	7.40	7.40	7.40	7.40	7.40
42	1993	SPRING	3	7.92	7.5700	8.39	0.43	0.25	5	7.57	7.57	7.79	8.39	8.39
42	1994	FALL	2	8.07	7.8400	8.30	0.33	0.23	4	7.84	7.84	8.07	8.30	8.30
42	1994	SPRING	1	7.90	7.9000	7.90	.	.	.	7.90	7.90	7.90	7.90	7.90
42	1994	SUMMER	1	9.30	9.3000	9.30	.	.	.	9.30	9.30	9.30	9.30	9.30
42	1995	FALL	3	8.27	7.6100	8.80	0.61	0.35	7	7.61	7.61	8.40	8.80	8.80
42	1995	SPRING	2	7.37	6.8100	7.92	0.78	0.55	11	6.81	6.81	7.37	7.92	7.92
42	1995	SUMMER	6	8.75	7.9000	9.30	0.52	0.21	6	7.90	8.50	8.80	9.20	9.30
42	1997	SPRING	1	7.45	7.4500	7.45	.	.	.	7.45	7.45	7.45	7.45	7.45
42	1998	SUMMER	1	8.78	8.7800	8.78	.	.	.	8.78	8.78	8.78	8.78	8.78
42	1999	FALL	8	8.37	7.9800	8.82	0.31	0.11	4	7.98	8.14	8.30	8.63	8.82
42	1999	SUMMER	8	8.26	7.7200	8.56	0.25	0.09	3	7.72	8.17	8.35	8.37	8.56
42	2000	SPRING	4	8.53	8.4100	8.66	0.10	0.05	1	8.41	8.46	8.53	8.61	8.66
42	2000	SUMMER	3	10.03	9.8000	10.20	0.21	0.12	2	9.80	9.80	10.10	10.20	10.20

APPENDIX C

Quality Control/Quality Assurance Rules

Continued Support for the Compilation and Analysis of National Nutrient Data

9 Nutrient Ecoregion/Waterbody Type Summary Chapters

Prepared for:

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Environmental Protection Agency
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Contract Number:68-C-99-226
Task Number:07
Subtask Number:4

August 27, 2001

CONTENTS

1.0 BACKGROUND

The Nutrient Criteria Program initiated the development of a national Nutrient Criteria Database application that is used to store and analyze nutrient data. The ultimate use of these data is to derive ecoregion specific nutrient criteria. EPA converted STOrage and RETrieval (STORET) legacy data, National Stream Quality Accounting Network (NASQAN) data, National Water-Quality Assessment (NAWQA) data, and other relevant nutrient data from universities and States/Tribes into the database. The data imported into the Nutrient Criteria Database are used to develop national nutrient criteria recommendations.

1.1 Purpose

The purpose of this deliverable is to provide EPA with information regarding the database used to create the statistical reports which will be used to derive ecoregion-specific nutrient criteria for Level III ecoregions. There are fourteen aggregate nutrient ecoregions. Each aggregate nutrient ecoregion is divided into smaller ecoregions (subecoregions) referred to as Level III ecoregions. EPA will determine criteria for the waterbody types and Level III ecoregions within the following aggregate nutrient ecoregions:

- Lakes and Reservoirs
  - Aggregate Nutrient ecoregions: 3, 4, 5, and 14

- Rivers and Streams
  - Aggregate Nutrient ecoregions: 1, 4, 5, 8, and 10

1.2 References

This section lists documents that contain baselines, standards, guidelines, policies, and references that apply to the data analysis. Listed editions were valid at the time of publication. All documents are subject to revision, but these specific editions govern the concepts described in this document.

Nutrient Criteria Technical Guidance Document: Lakes and Reservoirs (Draft). EPA, Office of Water, EPA 822-D-99-001, April 1999.

Nutrient Criteria Technical Guidance Manual: Rivers and Streams (Draft). EPA, Office of Water, EPA 822-D-99-003, September 1999.

Guidance for Data Quality Assessment: Practical Methods for Data Analysis. EPA, Office of Research and Development, EPA QA/G-9, January 1998.

2.0 QA/QC PROCEDURES

In order to develop nutrient criteria, EPA needed to obtain nutrient data from the states. EPA requested nutrient data from the states and forwarded the data sets to INDUS via e-mail and/or US mail. In addition, EPA tasked INDUS to convert data from three national data sets. EPA provided INDUS with a Legacy STORET extraction to convert into the database. The United States Geologic Survey (USGS) sent INDUS a CD-ROM with NASQAN data to convert. INDUS downloaded NAWQA files from the USGS Web site to convert the data. In total, INDUS converted and imported the following national and state data sets into the Nutrient Criteria Database:

- Legacy STORET
- NAWQA
- NASQAN
- EPA Region 1
- EPA Region 2 - Lake Champlain Monitoring Project
- EPA Region 2 - NYSDEC Finger Lakes Monitoring Program
- EPA Region 2 - NY Citizens Lake Assessment Program
- EPA Region 2 - Lake Classification and Inventory Survey
- EPA Region 2 - NYCDEP (1990-1998)
- EPA Region 2 - NYCDEP (Storm Event data)
- EPA Region 2 - New Jersey Nutrient Data (Tidal Waters)
- EPA Region 5
- EPA Region 3
- EPA Region 3 - Nitrite Data
- EPA Region 3 - Choptank River files
- EPA Region 4 - Tennessee Valley Authority
- EPA Region 7 - Central Plains Center for BioAssessment (CPCB)
- EPA Region 7 - REMAP
- EPA Region 2 - Delaware River Basin Commission (1990-1998)
- EPA Region 3 - PA Lake Data
- EPA Region 3 - University of Delaware
- EPA Region 10
- University of Auburn
- EPA Region 8 - MT and WY
- EPA Region 9
- Suffolk County
- NYCDEC
- NY Lakes Morphometry
- EPA Region 8 - South Dakota
- EPA Region 8 - Colorado Reservoir
- EPA Region 4
- EPA Region 10 - Lake Data
- EPA Region 7 - Central Plains Center for BioAssessment (CPCB) 2
- EPA Region 8 - North Dakota
- EPA Region 8 - Eagle River
- EPA Region 8 - Utah
- Florida

As part of the conversion process, INDUS performed a number of Quality Assurance/Quality Control (QA/QC) steps to ensure that the data were properly converted into the Nutrient Criteria Database. Sections 2.1 and 2.2 explain the steps performed by INDUS to convert the data.

2.1 National Data Sets

INDUS converted three national data sets into the Nutrient Criteria Database: Legacy STORET data, NASQAN data, and NAWQA data. A previous EPA contractor performed the extraction of Legacy STORET data and documented the QA/QC procedures used on the data. This documentation is included in Appendix A. INDUS performed minimal QA/QC on the Legacy STORET data set because the previous contractor completed the steps outlined in Appendix A. INDUS and EPA also agreed to convert the NAWQA and NASQAN data sets with minimal QA/QC on the assumption that the source agency, the USGS, QA/QC'd the data.

For each of the three national data sets, INDUS ran queries to determine if 1) samples existed without results and 2) if stations existed without samples. Per Task Order Project Officer (TOPO) direction, these records were deleted from the system. For analysis purposes, EPA determined that there was no need to keep station records with no samples and sample records with no results. INDUS also confirmed that each data set contained no duplicate records.

In addition, INDUS deleted all composite results from the Legacy STORET data. Per TOPO direction, it was decided that composite sample results would not be used in the statistical analysis.

2.2 State Data

Each state data set was delivered in a unique format. Many of the data sets were delivered to INDUS without corresponding documentation. INDUS analyzed each state data set in order to determine which parameters should be converted for analysis. INDUS obtained a master parameter table from EPA and converted the parameters in the state data sets according to those that were present in the EPA parameter table. INDUS converted all of the data elements in the state data sets that mapped directly to the Nutrient Criteria Database; data elements that did not map to the Nutrient Criteria Database were not converted. In some cases, state data elements that did not directly map into the Oracle database were inserted into a comment field within the database. Also, INDUS maintained an internal record of which state data elements were inserted into the comment field.

As part of the data clean-up efforts, INDUS determined whether or not there were any duplicate records in the state data sets and deleted the duplicate records. INDUS checked the waterbody, station, and sample entities for duplicate records. However, if there was not enough information provided to determine duplicates such as sampling date, there was no way for INDUS to locate duplicate records. In addition, INDUS deleted station records with no samples and sample records with no results. INDUS also deleted waterbody records that were not associated with a station. In each case, INDUS maintained an internal record of how many records were deleted.

If INDUS encountered referential integrity errors, such as samples that referred to stations that did not exist, or if INDUS was unsure of whether a record was a duplicate, INDUS contacted the agency directly via e-mail or phone to resolve any issues that arose. INDUS saved an electronic copy of each e-mail correspondence with the states to ensure that a record of the decision was maintained.

Finally, INDUS examined the remark codes of each result record in the state data sets. INDUS mapped the remark codes to the STORET remark codes listed in Table 2 of Appendix A. If any of the state result records were associated with remark codes marked as "Delete" in Table 2 of Appendix A, the result records were not converted into the database.

2.3 Laboratory Methods

Many of the state data sets did not contain laboratory method information. In addition, laboratory method information was not available for the three national data sets. In order to determine missing laboratory method information, EPA tasked another contractor to contact the data owners to obtain the laboratory method. In some cases, the data owners responded and the laboratory methods were added to the database. In other cases, the methods are unknown.

2.4 Waterbody Name and Class Information

A large percentage of the data did not have waterbody-specific information. The only waterbody information contained in the three national data sets was the waterbody name, which was embedded in the station 'location description' field. Most of the state data sets contained waterbody name information; however, much of the data were duplicated throughout the data sets. Therefore, the waterbody information was cleaned manually. For the three national data sets, the 'location description' field was extracted from the station table and moved to a temporary table. The 'location description' field was sorted alphabetically. Unique waterbodies were grouped together based on name similarity and whether or not the waterbodies fell within the same county, state, and waterbody type. Finally, the 'location description' field was edited to include only waterbody name information, not descriptive information. For example, 110 MILE CREEK AT POMONA DAM OUTFLOW, KS PO-2 was edited to 110 MILE CREEK. Also, if 100 MILE CREEK was listed ten times in New York, but in four different counties, four 100 MILE CREEK waterbody records were created.

Similar steps were taken to eliminate duplicate waterbody records in the state data sets. If a number of records had similar waterbody names and fell within the same state, county, and waterbody type, the records were grouped to create a unique waterbody record.

Most of the waterbody data did not contain depth, surface area, and volume measurements. EPA needed this information to classify waterbody types. EPA attempted to obtain waterbody class information from the states. EPA sent waterbody files to the regional coordinators and requested that certain class information be completed by each state. The state response was poor; therefore, EPA was not able to perform statistical analysis for the waterbody types by class.

2.5 Ecoregion Data

Aggregate nutrient ecoregions and Level III ecoregions were added to the database using the station latitude and longitude coordinates, the county centroid, or HUC (Hydrological Unit Code) centroid. If a station was lacking latitude and longitude coordinates and county information, the data were not included in the statistical analysis. Appendix B lists the steps taken to add the two ecoregion types (aggregate and Level III) to the Nutrient Criteria Database. The ecoregion names were pulled from aggregate nutrient ecoregion and Level III ecoregion Geographical Information System (GIS) coverages. In summary, the station latitude and longitude coordinates were used to determine the ecoregion under the following circumstances:

- The latitude and longitude coordinates fell within the county/state listed in the station table.
- The county data were missing.

The county centroid was used to determine the ecoregions under the following circumstances:

- The latitude and longitude coordinates were missing, but the state/county information was available.
- The latitude and longitude coordinates fell outside the county/state/HUC listed in the station table. The county information was assumed to be correct; therefore, the county centroid was used.

The HUC centroid was used to determine the ecoregions under the following circumstances:

- The latitude and longitude coordinates and county were missing, but the HUC information was available.

If the latitude and longitude coordinates fell outside the continental US county coverage file (i.e., the point fell in the ocean or Mexico/Canada), the nearest ecoregion was assigned to the station.

3.0 STATISTICAL ANALYSIS REPORTS

Aggregate nutrient ecoregion tables were created by extracting all observations for a specific aggregate nutrient ecoregion from the Nutrient Criteria Database. Then, the data were reduced to create tables containing only the yearly median values. To create these tables, the median value for each waterbody was calculated using all observations for each waterbody by Level III ecoregion, state, county, year, and season. Tables of decade median values were created from the yearly median tables by calculating the median for each waterbody by Level III ecoregion, state, county, decade and season.

The Data Source and the Remark Code reports were created using all observations (all reported values). All the other reports were created from either the yearly median tables or the decade median tables. In other words, the descriptive statistics and regressions were run using the median values for each waterbody and not the individual reported values.

Statistical analyses were performed under the assumption that this data set is a random sample. If this assumption cannot be verified, the observations may or may not be valid. Values below the 1st and 99th percentile were removed from the Legacy STORET database prior to the creation of the national database. Also, data were treated according to the Legacy STORET remark codes in Appendix A.

The following contains a list of each report and the purpose for creating each report:

- Data Source—Created to provide a count of the amount of data and to identify the source(s).
- Remark Codes—Created to provide a description of the data.
- Median of Each Waterbody by Year—This was an intermediate step performed to obtain a median value for each waterbody to be used in the yearly descriptive statistics reports and the regression models.
- Median of Each Waterbody by Decade—This was an intermediate step performed to obtain a median value for each waterbody to be used in the decade descriptive statistics.
- Descriptive Statistics—Created to provide EPA with the desired statistics for setting criteria levels.
- Regression Models—Created to examine the relationships between biological and nutrient variables.

Note: Separate reports were created for each season.

3.1 Data Source Reports

Data source reports were presented in the following formats:

- The number and percentage of data from each data source were summarized in tables for each aggregate nutrient ecoregion by season and waterbody type.

- The number and percentage of data from each data source were summarized in tables for each aggregate nutrient ecoregion for all seasons and waterbody type.

- The number and percentage of data from each data source were summarized in tables for each Level III ecoregion by season and waterbody type.

The ‘Frequency’ represents the number of data values from a specific data source for each parameter by data source. The ‘Row Pct’ represents the percentage of data from a specific data source for each parameter.

3.2 Remark Code Reports

Remark code reports were presented in the following formats:

- The number and percentage of data associated with a particular remark code for each parameter were summarized in tables by Level III ecoregion by decade and season.

- The number and percentage of data associated with a particular remark code for each parameter were summarized in tables by Level III ecoregion by year and season.

The 'Frequency' represents the number of data values corresponding to the remark code in the column. The 'Row Pct' represents the percentage of data that was associated with the remark code in that row.

In the database, remark codes that were entered by the states were mapped to Legacy STORET remark codes. Prior to the analysis, the data were treated according to these remark codes. For example, if the remark code was 'K,' then the reported value was divided by two. Appendix A contains a complete list of Legacy STORET remark codes.

Note: For the reports, a remark code of 'Z' indicates that no remark codes were recorded. It does not correspond to Legacy STORET code 'Z.'

3.3 Median of Each Waterbody

To reduce the data and to ensure heavily sampled waterbodies or years were not over represented in the analysis, median value tables (described above) were created. The yearly median tables and decade median tables were delivered to the EPA in electronic format as csv (comma separated value or comma delimited) files.

3.4 Descriptive Statistic Reports

The number of waterbodies, median, mean, minimum, maximum, 5th, 25th , 75th , 95th percentiles, standard deviation, standard error, and coefficient of variation were calculated. The tables (described above) containing the decade median values for each waterbody for each parameter were used to create descriptive statistics reports for:

- Level III ecoregions by decade and season
- Aggregate nutrient ecoregions by decade and season

In addition, the tables containing the yearly median values for each waterbody for each parameter were used to create descriptive statistics reports for:

- Level III ecoregions by year and season

3.5 Regression Models

Simple linear regressions using the least squares method were performed to examine the relationships between biological and nutrient variables in lakes and reservoirs, and rivers and streams. Regressions were performed using the yearly median tables. Chlorophyll(s) in micrograms per liter (ug/L), Secchi in meters (m), Dissolved Oxygen in milligrams per liter (mg/L), Turbidity, and pH were the biological variables in these models. Secchi data were used in the lake and reservoir models, and Turbidity data were used in the river and stream models.

The nutrient variables in these models include: Total Phosphorus in ug/L, Total Nitrogen in mg/L, Total Kjeldahl Nitrogen in mg/L, and Nitrate and Nitrite in mg/L.

4.0 TIME PERIOD

Data collected from January 1990 to December 2000 were used in the statistical analysis reports. To capture seasonal differences, the data were classified as follows:

- Aggregate nutrient ecoregions: 6, 7, and 8
  - Spring: April to May
  - Summer: June to August
  - Fall: September to October
  - Winter: November to March
- Aggregate nutrient ecoregions: 1, 2, 3, 4, 5, 9, 10, 11, 12, 13, and 14
  - Spring: March to May
  - Summer: June to August
  - Fall: September to November
  - Winter: December to February

5.0 DATA SOURCES AND PARAMETERS FOR THE AGGREGATE NUTRIENT ECOREGIONS

This section provides information for the nutrient aggregate ecoregions that were analyzed by waterbody type. Each section lists the data sources for the aggregate nutrient ecoregion including: 1) the data sources, 2) the parameters included in the analysis, and 3) the Level III ecoregions within the aggregate nutrient ecoregions.

Note: For analysis purposes, data for the following parameters were grouped together and reported under Phosphorous, Dissolved Inorganic (DIP):

Phosphorus, Dissolved Inorganic (DIP)
Phosphorus, Dissolved (DP)
Phosphorus, Dissolved Reactive (DRP)
Orthophosphate, dissolved, mg/L as P
Orthophosphate (OPO4_PO4)

5.1 Lakes and Reservoirs

5.1.1 Aggregate Nutrient Ecoregion 3

<u>Data Sources:</u>

Legacy STORET
EPA Region 10
EPA Region 8 - Colorado Reservoir

<u>Parameters:</u>

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
SECCHI (m)
pH

<u>Level III ecoregions:</u>

6, 10, 12, 13, 18, 20, 22, 24, 80, 81

5.1.2 Aggregate Nutrient Ecoregion 4

<u>Data Sources:</u>

Legacy STORET
EPA Region 8 - MT and WY
EPA Region 8 - South Dakota
EPA Region 8 - North Dakota

<u>Parameters:</u>

Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)

Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
SECCHI (m)
pH

Level III ecoregions:

26, 28, 30, 31, 43, 44

5.1.3 Aggregate Nutrient Ecoregion 5

Data sources:

Legacy STORET
EPA Region 8 - MT and WY
EPA Region 8 - South Dakota
EPA Region 8 - North Dakota

Parameters:

Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
SECCHI (m)
pH

Level III ecoregions:

25, 27, 32, 42

5.1.4 Aggregate Nutrient Ecoregion 14

Data sources:

Legacy STORET
Region 2 - NY Citizens Lake Assessment Program
Region 2 - NYCDEP (1990-1998)
EPA Region 1

Parameters:

CHLB (ug/L)
CHLC (ug/L)
Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric, uncorrected (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
SECCHI (m)
pH

Level III ecoregions:

59, 63, 84

5.2 Rivers and Streams

5.2.1 Aggregate Nutrient Ecoregion 1

Data sources:

Legacy STORET
NASQAN
NAWQA
EPA Region 10

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Periphyton, spectrophotometric, uncorrected (mg/sqm)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P(ug/L)
Turbidity (FTU)

Turbidity (NTU)
Turbidity (JCU)
pH

Level III ecoregions:

3, 7

5.2.2 Aggregate Nutrient Ecoregion 4

Data sources:

Legacy STORET
NASQAN
NAWQA
EPA Region 7 - Central Plains Center for BioAssessment (CPCB)
EPA Region 7 - Central Plains Center for BioAssessment (CPCB) 2
EPA Region 7 - REMAP
EPA Region 8 - MT and WY
EPA Region 8 - South Dakota
EPA Region 8 - North Dakota

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Pheophytin, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Organic_P (ug/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P(ug/L)
Turbidity (FTU)
Turbidity (NTU)
Turbidity (JCU)
pH

Level III ecoregions:

26, 28, 30, 31, 43, 44

5.2.3 Aggregate Nutrient Ecoregion 5

Data sources:

Legacy STORET
NASQAN
NAWQA
EPA Region 7 - Central Plains Center for BioAssessment (CPCB)
EPA Region 7 - Central Plains Center for BioAssessment (CPCB) 2
EPA Region 7 - REMAP
EPA Region 8 - MT and WY
EPA Region 8 - South Dakota
EPA Region 8 - North Dakota

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Pheophytin, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Organic_P (ug/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P (ug/L)
Turbidity (FTU)
Turbidity (NTU)
Turbidity (JCU)
pH

Level III ecoregions:

25, 27, 32, 42

5.2.4 Aggregate Nutrient Ecoregion 8

Data sources:

Legacy STORET
NASQAN
NAWQA
EPA Region 2 - NYCDEP (1990-1998)
EPA Region 1

EPA Region 3
EPA Region 5

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric, uncorrected (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P (ug/L)
Turbidity (FTU)
Turbidity (NTU)
pH

Level III ecoregions:

49, 50, 58, 62, 82

5.2.5 Aggregate Nutrient Ecoregion 10

Data sources:

Legacy STORET
NASQAN
EPA Region 7 - Central Plains Center for BioAssessment (CPCB)
EPA Region 7 - Central Plains Center for BioAssessment (CPCB) 2
EPA Region 7 - REMAP

Parameters:
Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Pheophytin, corrected (ug/L)
Chlorophyll A, Phytoplankton, chromotographic- fluorometric (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Chlorophyll B, Phytoplankton, chromotographic- fluorometric (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)

Nitrogen, Total Kjeldhal (TKN) (mg/L)
Organic_P (ug/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P(ug/L)
Turbidity (FTU)
Turbidity (NTU)
Turbidity (JCU)
pH

Level III ecoregions:

34, 73

APPENDIX A. Process Used to QA/QC the Legacy STORET Nutrient Data Set

1. STORET water quality parameters and Station and Sample data items were retrieved from USEPA's mainframe computer. Table 1 lists all retrieved parameters and data items.

TABLE 1: PARAMETERS AND DATA ITEMS RETRIEVED FROM STORET

Parameters Retrieved (STORET Parameter Code)	Station Data Items Included (STORET Item Name)	Sample Data Items Included (STORET Item Name)
TN - mg/l (600) TKN - mg/l (625) Total Ammonia (NH3+NH4) - mg/l (610) Total NO2+NO3 - mg/l (630) Total Nitrite - mg/l (615) Total Nitrate - mg/l (620) Organic N - mg/L (605) TP - mg/l (665) Chlor *a* - ug/L (spectrophotometric method, 32211) Chlor *a* - ug/L (fluorometric method corrected, 32209) Chlor *a* - ug/L (trichromatic method corrected, 32210) Secchi Transp. - inches (77) Secchi Transp. - meters (78) +Turbidity JCUs (70) +Turbidity FTUs (76) +Turbidity NTUs field (82078) +Turbidity NTUs lab (82079) +DO - mg/L (300) +Water Temperature (degrees C, 10/degrees F, 11)	Station Type (TYPE) Agency Code (AGENCY) Station No. (STATION) Latitude - std. decimal degrees (LATSTD) Longitude - std. decimal degrees (LONGSTD) Station Location (LOCNAME) County Name (CONAME) State Name (STNAME) Ecoregion Name - Level III (ECONAME) Ecoregion Code -Level III (ECOREG) Station Elevation (ELEV) Hydrologic Unit Code (CATUNIT) RF1 Segment and Mile (RCHMIL) RF1ON/OFF tag (ONOFF)	Sample Date (DATE) Sample Time (TIME) Sample Depth (DEPTH) Composite Sample Code (SAMPMETH)
+ If data record available at a station included data only for this or other such marked parameters, data record was deleted from data set.		

The following set of retrieval rules were applied to the retrieval process:

- Data were retrieved for waterbodies specified only as **'lake', 'stream', 'reservoir', or 'estuary'** under "Station Type" parameter**.** Any stations specified as 'well,' 'spring,' or 'outfall' were eliminated from the retrieved data set.

- Data were retrieved for station types described as 'ambient' (e.g., no pipe or facility discharge data) under the "Station Type" parameter.

- Data were retrieved that were designated as 'water' samples only. This includes 'bottom' and 'vertically integrated' water samples.

- Data were retrieved that were designated as either 'grab' samples and 'composite' samples (mean result only).

- No limits were specified for sample depths.

- Data were retrieved for all fifty states, Puerto Rico, and the District of Columbia.

- The time period specified for data retrieval was January 1990 to September 1998.

- No data marked as “Retired Data” (i.e., data from a generally unknown source) were retrieved.

- Data marked as “National Urban Runoff data” (i.e., data associated with sampling conducted after storm events to assess nonpoint source pollutants) were included in the retrieval. Such data are part of STORET’s ‘Archived’ data.

- Intensive survey data (i.e., data collected as part of specific studies) were retrieved.

2. Any values falling below the 1st percentile and any values falling above the 99th percentile were transformed into ‘missing’ values (i.e., values were effectively removed from the data set, but were not permanently eliminated).

3. Based on the STORET ‘Remark Code’ associated with each retrieved data point, the following rules were applied (Table 2):

TABLE 2: STORET REMARK CODE RULES

STORET Remark Code	Keep or Delete Data Point
blank - Data not remarked.	Keep
A - Value reported is the mean of two or more determinations.	Keep
B - Results based upon colony counts outside the acceptable ranges.	Delete
C -Calculated. Value stored was not measured directly, but was calculated from other data available.	Keep
D - Field measurement.	Keep
E - Extra sample taken in compositing process.	Delete
F - In the case of species, F indicates female sex.	Delete
G - Value reported is the maximum of two or more determinations.	Delete
H - Value based on field kit determination; results may not be accurate.	Delete
I - The value reported is less than the practical quantification limit and greater than or equal to the method detection limit.	Keep, but used one-half the reported value as the new value.
J - Estimated. Value shown is not a result of analytical measurement.	Delete

TABLE 2: STORET REMARK CODE RULES	
K - Off-scale low. Actual value not known, but known to be less than value shown.	Keep, but used one-half the reported value as the new value.
L - Off-scale high. Actual value not known, but known to be greater than value shown.	Keep
M -Presence of material verified, but not quantified. Indicates a positive detection, at a level too low to permit accurate quantification.	Keep, but used one half the reported value as the new value.
N -Presumptive evidence of presence of material.	Delete
O -Sample for, but analysis lost. Accompanying value is not meaningful for analysis.	Delete
P -Too numerous to count.	Delete
Q -Sample held beyond normal holding time.	Delete
R -Significant rain in the past 48 hours.	Delete
S -Laboratory test.	Keep
T -Value reported is less than the criteria of detection.	Keep, but replaced reported value with 0.
U -Material was analyzed for, but not detected. Value stored is the limit of detection for the process in use.	Keep, but replaced reported value with 0.
V -Indicates the analyte was detected in both the sample and associated method blank.	Delete
W -Value observed is less than the lowest value reportable under remark "T."	Keep, but replaced reported value with 0.
X -Value is quasi vertically-integrated sample.	No data point with this remark code in data set.
Y -Laboratory analysis from unpreserved sample. Data may not be accurate.	Delete
Z -Too many colonies were present to count.	Delete
If a parameter (excluding water temperature) value was less than or equal to zero and no remark code was present, the value was transformed into a missing value. Rationale - Parameter concentrations should never be zero without a proper explanation. A method detection limit should at least be listed	

4. Station records were eliminated from the data set if any of the following descriptors were present within the "Station Type" parameter:

- **MONITR -** Source monitoring site, which monitors a known problem or to detect a specific problem.
- **HAZARD -** Site of hazardous or toxic wastes or substances.
- **ANPOOL -** Anchialine pool, underground pools with subsurface connections to watertable and ocean.
- **DOWN -** Downstream (i.e., within a potentially polluted area) from a facility which has a potential to pollute.
- **IMPDMT -** Impoundment. Includes waste pits, treatment lagoons, and settling and evaporation ponds.
- **STMSWR -** Storm water sewer.
- **LNDFL** - Landfill.
- **CMBMI -** Combined municipal and industrial facilities.
- **CMBSRC -** Combined source (intake and outfall).

Rationale - these descriptors potentially indicate a station location that at which an ambient water sample would not be obtained (i.e., such sampling locations are potentially biased) or the sample location is not located within one of the designated water body types (i.e, ANPOOL).

5. Station records were eliminated from data set if the station location did not fall within any established cataloging unit boundaries based on their latitude and longitude.

6. Using nutrient ecoregion GIS coverage provided by USEPA, all station locations with latitude and longitude coordinates were tagged with a nutrient ecoregion identifier (nutrient region identifiers are values 1 - 14) and the associated nutrient ecoregion name. Because no nutrient ecoregions exist for Alaska, Hawaii, and Puerto Rico, stations located in these states were tagged with "dummy" nutrient ecoregion numbers (20 = Alaska, 21 = Hawaii, 22 = Puerto Rico).

7. Using information provided by TVA, 59 station locations that were marked as 'stream' locations under the "Station Type" parameter were changed to 'reservoir' locations.

8. The nutrient data retrieved from STORET were assessed for the presence of duplicate data records. The duplicate data identification process consisted of three steps: 1) identification of records that matched exactly in terms of each variable retrieved; 2) identification of records that matched exactly in terms of each variable retrieved except for their station identification numbers; and 3) identification of records that matched exactly in terms of each variable retrieved except for their collecting agency codes. The data duplication assessment procedures were conducted using SAS programs.

Prior to initiating the data duplication assessment process, the STORET nutrient data set contained:

41,210 station records
924,420 sample records

- Identification of exactly matching records
  All data records were sorted to identify those records that matched exactly. For two records to match exactly, all variables retrieved had to be the same. For example, they had to have the same water quality parameters, parameter results and associated remark codes, and have the same station data item and sample data item information. Exactly matching records were considered to be exact duplicates, and one duplicate record of each identified matching set were eliminated from the nutrient data set. A total of 924 sample records identified as duplicates by this process were eliminated from the data set.

- Identification of matching records with the exception of station identification number
  All data records were sorted to identify those records that matched exactly except for their station identification number (i.e., they had the same water quality parameters, parameter results and associated remark codes, and the same station and sample data item information with the exception of station identification number). Although the station identification numbers were different, the latitude and longitude for the stations were the same indicating a duplication of station data due to the existence of two station identification numbers for the same station. For each set of matching records, one of the station identification numbers was randomly selected and its associated data were eliminated from the data set. A total of 686 sample records were eliminated from the data set through this process.

- Identification of matching records with the exception of collecting agency codes
  All data records were sorted to identify those records that matched exactly except for their collecting agency codes (i.e., they had the same water quality parameters, parameter results and associated remark codes, and the same station and sample data item information with the exception of agency code). The presence of two matching data records each with a different agency code attached to it suggested that one agency had utilized data collected by the other agency and had entered the data into STORET without realizing that it already had been placed in STORET by the other agency. No matching records with greater than two different agency codes were identified. For determining which record to delete from the data set, the following rules were developed:

  - If one of the matching records had a USGS agency code, the USGS record was retained and the other record was deleted.
  - Higher level agency monitoring program data were retained. For example, federal program data (indicated by a “1" at the beginning of the STORET agency code) were retained against state (indicated by a “2") and local (indicated by values higher than 2) program data.
  - If two matching records had the same level agency code, the record from the agency with the greater number of overall observations (potentially indicating the data set as the source data set) was retained.

  A total of 2,915 sample records were eliminated through this process.

As a result of the duplicate data identification process, a total of 4,525 sample records and 36 individual station records were removed from the STORET nutrient data set. The resulting nutrient data set contains the following:

41,174 station records
919,895 sample records

APPENDIX B. Process for Adding Aggregate Nutrient Ecoregions and Level III Ecoregions

The flag_id tracks the type of changes that were made to the data. There are a total of eight flags that are used to describe the changes made to the data. The flags are defined as follows:

1—The latitude and longitude coordinates match the county that was provided. If the HUC was null, it was updated based on the latitude and longitude coordinates. The ecoregions were determined by using the latitude and longitude coordinates.

2—The county and HUC are available, but the latitude and/or longitude coordinates are missing. Therefore, the centroid of the intersection of the county and HUC was used to determine the ecoregions and the latitude and longitude coordinates. If the HUC and county did not intersect, the county centroid was used to determine the ecoregions and the latitude and longitude coordinates.

3—The county is available, but the HUC and the latitude and/or longitude coordinates are missing. Therefore, the county centroid was used to determine the ecoregions, HUC, and the latitude and longitude coordinates.

4—The HUC is available, but the county is not and the latitude and/or longitude coordinates are missing. Therefore, the HUC centroid was used to determine the ecoregions, county, and the latitude and longitude coordinates.

5—The county is missing, but the latitude and longitude coordinates are available. Note: A county is considered missing if it is invalid. In other words, if the county entered did not exist in the state, it was considered null. Therefore, the latitude and longitude coordinates were used to determine the ecoregions, county, and HUC (if it was missing).

6—The latitude and longitude coordinates did not match the county that was provided, but they did match the HUC. Therefore, the county centroid was used to determine ecoregion values.

7—The latitude and longitude coordinates did not match the county or the HUC that was provided (including null HUCs). Therefore, the county centroid was used to determine ecoregion values.

8—The latitude and longitude coordinates were missing, but the ecoregions were provided by the state.
The ecoregions provided by the states were used as the ecoregion values.

APPENDIX C. Glossary

Coefficient of Variation - A measure of variability. The standard deviation divided by the mean multiplied by 100.

Maximum - The highest value.

Mean – A measure of central tendency. The arithmetic average.

Median – A measure of central tendency. The value which cuts the distribution in half, such that half of the values are above the median, and half of the values are below the median. Also called the 50th percentile or middle value.

Minimum - The lowest value.

Standard Deviation – A measure of variability. The square root of the variance with the variance defined as the sum of the squared deviations divided by the sample size minus one.

Standard Error - A measure of variability. The standard deviation divided by the square root of the sample size.

5^{th} % - the 5^{th} percentile

25^{th} % - the 25^{th} percentile, the first quartile.

75^{th} % - the 75^{th} percentile, the third quartile.

95^{th} % - the 95^{th} percentile